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DEPARTMENT OF COMMERCE AND LABOR

COAST AND GEODETIC SURVEY

U. S. HYDROGRAPHIC SURVEY

OFFICE OF THE SURVEYOR GENERAL

HYPSOMETRY

PRECISE LEVELING IN THE UNITED STATES

1898-1907

WITH A READJUSTMENT OF THE LEVEL NET  
AND RESULTING ELEVATIONS

BY

JOHN T. HAYFORTH

Surgeon General of the Coast and Geodetic Survey,  
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AND

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WASHINGTON

GOVERNMENT PRINTING OFFICE

1909



DEPARTMENT OF COMMERCE AND LABOR

COAST AND GEODETIC SURVEY

O. H. TITTMANN

SUPERINTENDENT

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HYPSONOMETRY

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AND

L. PIKE

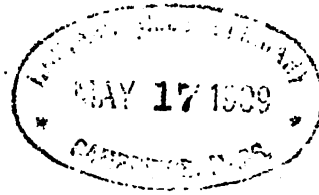
Computer, Coast and Geodetic Survey



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# PRECISE LEVELING IN THE UNITED STATES, 1903-1907, WITH A READJUSTMENT OF THE LEVEL NET AND RESULTING ELEVATIONS.

By JOHN F. HAYFORD, *Inspector of Geodetic Work, Assistant, Coast and Geodetic Survey;* and L. PIKE, *Computer, Coast and Geodetic Survey.*

## GENERAL STATEMENT.

This publication is a supplement to Appendix 8, Report of the Superintendent of the Coast and Geodetic Survey for 1899, entitled "Precise Leveling in the United States," and Appendix 3, Report for 1903, entitled "Precise Leveling in the United States, 1900-1903, with a Readjustment of the Level Net and Resulting Elevations." The purpose of Appendix 8, Report for 1899, was, as stated in its introduction, to bring the publication in detail of the results of precise leveling by the Coast and Geodetic Survey as nearly as possible up to date; to set forth the methods employed in making a general adjustment of the precise level net covering the eastern half of the United States and involving leveling by other organizations as well as by the Coast and Geodetic Survey; to put into print in convenient form for ready reference a concise compilation of the corrected elevations resulting from this general adjustment; and, finally, to make available in form for general use, examination, and criticism the more important items of information and opinions in regard to precise leveling which have been acquired during the course of a long and careful investigation of the problem of making such an adjustment and of securing the highest degree of accuracy in future precise level observations consistent with a reasonable degree of economy and rapidity. The purpose of Appendix 3, Report for 1903, was to furnish such additions and corrections as would bring the information in regard to precise leveling in the United States up to 1903. The purpose of the present publication is to give similar information for the period 1903-1907.

In 1903 two new lines were run by the Coast and Geodetic Survey, with an aggregate length of 1 319 kilometers (819 miles). One was from Red Desert, Wyo., to Owyhee, Idaho, an advance of 625 miles on the line to the Pacific coast. The second was from Holland to New Braunfels, Tex. It was connected with the Seguin Base and with a triangulation station near Austin, and thus controls the elevations on that section of the ninety-eighth meridian triangulation.

In 1904 two new lines were run by the Coast and Geodetic Survey, with an aggregate length of 1 419 kilometers (882 miles). The first was from Owyhee, Idaho, to Seattle, Wash., and furnished the first connection by precise leveling

between the Atlantic and Pacific oceans. The second was from St. Cloud, Minn., to Watertown, S. Dak. This was part of a large circuit completed later, and by its connection with several triangulation stations controls the elevations of the section of the ninety-eighth meridian triangulation in that region.

In 1905 three new lines were run by the Coast and Geodetic Survey, with an aggregate length of 834 kilometers (518 miles). The line from Watertown, S. Dak., to Sioux City, Iowa, with the leveling mentioned above, from St. Cloud to Watertown, adds a large new circuit to the level net by connecting the lines along the Mississippi and Missouri rivers, run under the direction of the Corps of Engineers, U. S. Army, and already in the net. The second line was from Evansville to Stephen, Minn., to connect with the Stephen Base, and to control the elevations of that section of the ninety-eighth meridian triangulation. The third line was from Chicago Junction to Deshler, Ohio, and connected the leveling of the Baltimore and Ohio Railroad, which extended to Chicago Junction, with the line Gibraltar to Cincinnati, already in the level net. This connection showed a discrepancy of approximately 1 meter between adjusted elevations at Deshler and elevations based on the elevation of Chicago Junction as determined by the Baltimore and Ohio Railroad line. The line Chicago Junction to Deshler was then rerun, at least once, over its entire length, and the first results were verified, showing that no such mistake was made on this line. In 1906 a rerunning of part of the Baltimore and Ohio Railroad leveling located the mistake at Hereford, Ohio. Nine kilometers (6 miles) of leveling were also run in the city of Baltimore to connect the leveling of the Baltimore and Ohio Railroad with sea level at that point.

In 1906 four new lines were run, with an aggregate length of 404 kilometers (251 miles). The first was from Smithville to Galveston, Tex., and gave a new connection with sea level on the Gulf of Mexico. The second was from Greenwich to Sullivan, Ohio, over a section of leveling of the Baltimore and Ohio Railroad. This leveling located the mistake which had produced the discrepancy mentioned in the preceding paragraph. The United States Geological Survey, from the circuits of its primary leveling, suspected that other smaller mistakes existed in the leveling of the Baltimore and Ohio Railroad. The two lines, Ellwood City to Monaca, Pa., and Alliance to Struthers, Ohio, were run to discover and correct these mistakes.

In 1906 and 1907 lines were run by this Survey from San Diego, Cal., to Las Vegas, Nev.; from Ogden to Salt Lake City, Utah, and from Pocatello, Idaho, to Billings, Mont. These lines are not involved in the adjustment of the level net, as they are each connected with the net (or with sea level) at one end only and do not close any circuit. They are not yet ready for publication.

Besides the new lines by the Coast and Geodetic Survey, the following lines, run by other organizations, were added to the level net:

First. Six lines run under the direction of the Corps of Engineers, U. S. Army, and the Mississippi River Commission, with an aggregate length of 1 220 kilometers (758 miles). One, from Fort Adams to Vicksburg, Miss., supersedes the line between those points run by the Coast and Geodetic Survey in 1880. A line from Shreveport, La., to Camden, Ark., and two short lines in Louisiana, one from Archibald to Columbia, and one from the mouth of the Black River to Barbin, a

point on the Shreveport to Smithland line, subdivided a number of circuits in the southern part of the net and changed the elevations in that region materially. The fifth line, from Grafton to Chicago, Ill., together with a line run by the United States Geological Survey, from Pekin to Olney, divided the large circuit, Grafton-Savanna-Chicago-Mackinaw-Gibraltar-Cincinnati-St. Louis-Grafton, into three smaller circuits. The sixth line, from Grand Rapids to Aitkin, Minn., completed a small circuit.

Second. The United States Geological Survey during 1905-6 ran five lines with an instrument of the same type as the Coast and Geodetic Survey level, described on pages 200-211 of Appendix 3, Report for 1903. The aggregate length of these lines is 731 kilometers (454 miles), and they form parts of seven new circuits. The first and second are from Pekin to Champaign and from Olney to Champaign, forming the line, Pekin to Olney, mentioned above. The third is from Portsmouth to Chillicothe, Ohio, connecting the Coast and Geodetic Survey leveling at Chillicothe with the leveling along the Ohio River. The fourth is from Chillicothe to Columbus, Ohio. The fifth is from Valley Crossing, a point on the fourth line, to Uhrichsville, Ohio, where it connects with the leveling of the Baltimore and Ohio Railroad, described in the next paragraph.

Third. The Baltimore and Ohio Railroad furnished 1 031 kilometers (641 miles) of leveling to the level net. One line was a continuation of the work of 1902 \* and extends from Foley, Pa., to Chicago Junction, Ohio. A section of this line, however, between Struthers and East Akron Junction, Ohio, was not used on account of checks indicating large errors or mistakes in it. The second line is from Warwick, a point on the first line, to Benwood, near Wheeling, W. Va. The third line is from Cumberland, Md., to Benwood, W. Va. The fourth line is from Washington, D. C., to Baltimore, Md., where it was connected by the Coast and Geodetic Survey with sea level. The fifth line is from Relay, Md., a point on the preceding line, to Washington Junction, Md., where it connects with the Baltimore and Ohio Railroad leveling of 1902.\* The Baltimore and Ohio Railroad thus furnished one large circuit and one small circuit of its own leveling and several connections with other leveling of the level net.

Fourth. One line of wye leveling of the same class as the leveling along the Ohio River, described on page 347 of Appendix 3, Report for 1903, and run under the direction of the Corps of Engineers, U. S. Army, was added to the net. It extends from Zanesville to Marietta, Ohio, along the Muskingum River (122 kilometers, or 76 miles) and furnishes a second connection between the United States Geological Survey new leveling and the Ohio River line.

There have thus been added to the level net since it was adjusted in 1903, 4 000 kilometers (2 500 miles) of leveling by the Coast and Geodetic Survey, and 2 750 kilometers (1 700 miles) by other organizations. Of these lines, two lines in Minnesota and two in Louisiana, with a total length of 506 kilometers (314 miles), are spurs from the net. All other lines form links or parts of links of the net and are concerned in the adjustment.

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\* See page 348 of Appendix 3, Report of the Coast and Geodetic Survey for 1903, "Precise Leveling in the United States."

The composition of the level net, as adjusted in 1907, including all spur lines, but excluding all superseded lines, is as follows:

	Kilometers.	Miles.
Leveling by Coast and Geodetic Survey previous to 1899.....	6 923	4 302
Leveling by Coast and Geodetic Survey in 1899 and later.....	9 542	5 929
Leveling by United States Geological Survey in 1905 and 1906.....	731	454
Leveling by United States Geological Survey previous to 1905.....	4 015	2 495
Leveling by United States Lake Survey.....	1 009	627
Water leveling.....	4 378	2 720
Leveling by Corps of Engineers, U. S. Army, Mississippi River Commission, and Missouri River Commission, with Kern levels.....	8 213	5 103
Leveling by Baltimore and Ohio Railroad.....	1 314	816
Miscellaneous lines of leveling.....	2 234	1 388
Total.....	38 359	23 834

The new leveling added since the adjustment of 1903 was made constitutes 18 per cent of the net as now adjusted. There are three new connections with sea level, at Seattle, Wash., at Galveston, Tex., and at Baltimore, Md. The discrepancy found at Seattle between the elevations based on sea level from tide observations at that point, and the elevations based on the elevation of Cheyenne as adjusted in 1903, was 187.5 millimeters.\* This closure, which is well within the allowable limits of error in the leveling, affects principally the elevations in the western part of the net and has but little, if any, effect on the many elevations in the eastern part. The closure at Galveston was only 26.6 millimeters and affects appreciably only the elevations in Texas. The new connection at Baltimore supersedes the old one at Washington, but was found to make no change necessary in elevations in Washington. The new and strong connection between the leveling through the Great Lakes and the leveling in the western part of the United States, from St. Cloud to Sioux City, had considerable effect to the west and south, but less to the east. The effect of the other leveling was largely local.

When there is added to such a level net as that which was fully and carefully adjusted in 1903 so much new, accurate, and important leveling as is indicated above, the first question that arises is: How much change will this necessarily make in elevations already published? It is a great convenience to have fixed assigned elevations for bench marks—standard elevations, so to speak—to which all other elevations in surrounding regions shall be referred, and to make no changes in these values unless necessary. Every change in the assigned elevations of the principal bench marks is liable to cause inconvenience to engineers outside the Survey, as well as to the Survey, by making extensive changes necessary in computations based upon these assigned elevations. On the other hand, however desirable it may be to have fixed values for the elevations of the principal bench marks, and so to make no changes in those which have already been given to the public in print, it is not desirable to keep a value for an elevation unchanged when later leveling gives a value differing from it greatly which is determined with a higher degree of accuracy. Therefore, it is never possible to adopt a final standard value for the elevation of any bench mark unless it is positively known that no more precise leveling connected with the net will be done, or else that, if done, it

\*See page 198, Appendix 4, Report for 1905, "Precise Leveling from Red Desert, Wyoming, to Seattle, Wash., 1903-1904."

will not be utilized to improve the existing assigned elevation, for all new leveling, besides giving elevations for points not previously determined, affects, by its connections, many elevations in the net as already adjusted, the effect being necessarily greater in the vicinity of the new leveling than in regions more remote. But if all new leveling is to be utilized to the fullest extent in securing elevations of the highest degree of accuracy in every part of the net, then whenever new leveling forming links in the net is secured, the whole net must be readjusted and the old adjusted elevations must be completely superseded by the new.

Neither of the radical plans indicated above—either to hold all old elevations without change and merely to fit new leveling to the old, or to supersede all old elevations by new ones—seems desirable. But a conservative procedure, intermediate between the two, is possible.

If, after a complete readjustment of the level net, the change in the published elevation of any junction point required by the new adjustment is very small, or, in other words, elevations from the old and new adjustments agree closely, it seems best to hold the elevations already published. Especially does it seem certain that, whenever the change called for by the new adjustment is much smaller than the uncertainties in the new adjusted elevations, no change should be made. So, also, when for any link in the net the new adjustment gives a difference of elevation far within the limits of uncertainty of the new adjusted difference, it seems that the old difference of elevation should be held without change, even though a constant correction to the elevations along the line is found to be necessary.

Applying these principles to the adjustment of 1907, it was decided to hold, without change, all elevations in New York and many in Pennsylvania, all elevations and differences of elevation through the Great Lakes, all elevations in North Carolina, Georgia, Tennessee, Kentucky, and many in Texas, and to hold many differences of elevation in Ohio. The unchanged elevations, nearly 3 000 in number, are not reprinted in this publication. The index, however, is complete for all elevations and descriptions and shows clearly where the adopted elevations may be found. It is believed that these adopted elevations are substantially as good as any that can be deduced from the leveling available at this office up to date (June, 1908).

The adjustment of 1899 fixed the elevation of 4 200 bench marks, that of 1903 of 6 900 bench marks, and the present adjustment of 1907 fixes the elevation of 9 100 bench marks.

Descriptions are given in this publication for all bench marks of which descriptions are not now in print in the publications of this Survey. Revised descriptions and additional notes to descriptions previously published are introduced as the result of information acquired since the previous publications, or to correct mistakes. The index in every case gives a reference to the publication in which the full description occurs and to any later notes.

#### THE NEW COAST AND GEODETIC SURVEY LEVEL LINES.

All lines in 1903 to 1907, except one, were run with the new Coast and Geodetic Survey level, which is fully described in Appendix 3, Report for 1903, pages 200-211. The exception was St. Cloud, Minn., to Watertown, S. Dak., which was run with an instrument of the intermediate type described on page 418 of Appendix 8, Report for 1899. The rods were of the direct reading type and carry a centimeter graduation

on which readings are made to millimeters by estimation. This type is described in Appendix 8, Report for 1899, pages 418-419.

In August, 1903, the experiment was made of using a point marked on the top of the rail of the railroad track as the rod support.\* A full account of this experiment with the results is given on pages 416-418 of Appendix 6, Report for 1904, entitled "Precise Leveling from Red Desert, Wyo., to Owyhee, Idaho, 1903."

The most prominent effect was to change the rate of accumulation of discrepancy between the forward and backward lines. This is a clear confirmation of the theory that the accumulated discrepancy is due mainly to systematic rising or settling of rod supports. This theory is based upon the frequently observed fact that when a change is made in the method of rod support or in the habits of the rodman, a change is liable to take place in the rate of accumulation of discrepancy between the forward and backward lines.

The evidence showed clearly that the use of the rail for the rod support increased both the speed and accuracy of the leveling, and the practice has been adopted in all Coast and Geodetic Survey leveling since that time.

Two uncertainties in connection with this method of rod support will occur to anyone who considers it carefully, namely, the uncertainty as to whether the rodman holds the foot of the rod for both foresight and backsight on precisely the same point on the slightly rounding and sometimes inclined surface of the top of the rail, and the uncertainty as to the recovery by the rail of its former elevation after a train has passed over it.

The first of these uncertainties is very small, provided the rodman is careful. No difficulty was found in marking the exact spot on the rail which was used in such a way, with chalk or keel, that the mark was recoverable, even after a train had passed over it.

Direct observations have indicated that, as a rule, the rail rises to sensibly its former elevation quickly after a train passes. Doubtless there are exceptional cases. The best proof available that such cases are comparatively rare for the conditions under which the rail was used as a rod support, and that the systematic permanent settling of the rail caused by the passage of the train is exceedingly small, is furnished by the comparison given in Appendix 6, Report for 1904, of the accuracy of the leveling by each party before and after beginning the use of the rail as a rod support, and this has been confirmed by the good results obtained on later lines.

The footpins were carried along with each party during the progress of the leveling and were used whenever a train was known to be approaching, or when there were special reasons for supposing that the track was not in as stable a condition as usual. The results are not subject, therefore, to the possible uncertainty arising from the action of every train.

#### INSTRUCTIONS FOR PRECISE LEVELING.

The general instructions issued to the leveling parties in 1908 are given below. Those issued in 1903-1907 differ from these only in minor matters and in not being so complete.

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\* Mr. F. W. Perkins, Assistant Superintendent, who was the observer on the line from Washington to Annapolis, 1875, states that the rods were supported upon the railroad rails, although that fact was not especially noted in the record, as this was the ordinary practice at that time.

In order that the reader may comprehend fully the spirit of the general instructions shown below, it may be well to call special attention here to three main points in regard to the new instrument:

First. The instrument is irreversible and as simple as possible. The telescope is supported directly on trunnions between the objective and the middle of the telescope and on the point of a micrometer screw near the eye end. It is therefore not capable of being rotated about its axis of figure. The level vial is fixed relatively to the telescope, except that the small range necessary for adjustment is provided. This makes it necessary to test the adjustment by a modification of the well-known peg method, as indicated later in the instructions. The simple instrument is used, as will be seen later, with an extremely simple programme of observation.

Second. A device for reading the bubble has been supplied which enables the observer to stand erect at all times and see the bubble and the rod alternately in quick succession without moving the eye and without even refocusing the eyes, the only change required being a mere shifting of the attention from one eye to the other.

Third. Great care has been taken in all the features in the design of the instrument to prevent errors in observation due to changes in the relative temperature of different parts of the instrument.

#### GENERAL INSTRUCTIONS FOR PRECISE LEVELING, 1908.

1. Except when specific instructions are given to proceed otherwise, all lines are to be leveled independently in both the forward and backward direction.

2. The distance between successive permanent bench marks shall nowhere exceed 15 kilometers. There shall be no portion of the line 100 kilometers long in which there are not at least 20 permanent bench marks. No permanent bench mark is to be counted in considering these limits unless it is adequately described, nor shall both of two bench marks be counted if they are placed so near to one another and in such similar conditions of exposure as to be likely to be destroyed at the same time. The preceding statements refer to all permanent bench marks with which the leveling is directly connected, regardless of whether they are new bench marks or old ones established by other organizations. The above-stated limits are to be regarded as extreme lower limits. It is desired that the number of bench marks shall in general greatly exceed that necessary to keep barely within the limits. A good example to emulate is the line Dobbs Ferry to Greenbush, N. Y., 1902, on which the average distance between bench marks was 2.5 kilometers. It is desired also that the bench marks in each general locality shall belong in part to each of several classes, such as bolts or other marks on buildings, squares cut or bolts sunk in railroad masonry, such as bridge piers, water tanks, etc., stone posts, and iron pipe bench marks.

3. The line of levels is to be broken by temporary bench marks into sections from 1 to 2 kilometers long, except where special conditions make shorter sections advisable.

4. At each city along the line the leveling should be connected with the nearest stable bench marks which are connected with the city datum. Connections should also be made with all stable railroad bench marks and bench marks of other organizations which may be found along the route.

5. All old bench marks are to be called by their old names and are to be fully described by quoting the old description, if one is available, and by making additions to it.

6. All new bench marks are to be designated by capital letters with numerical subscripts after the alphabet has been exhausted in each State.

7. The elevation of the top of the railroad rail in front of each railway station along the line of levels is to be determined by a single reading taken from the nearest instrument station.

8. It is desirable that the backward measurement on each section should be made under different atmospheric conditions from those which occurred on the forward measurement. It is especially desirable to make the backward measurement in the afternoon if the forward measurement was made in the forenoon, and vice versa. The observer is to secure as much difference of conditions between the forward and backward measurements as is possible without materially delaying the work for that purpose.



9. On all sections upon which the forward and backward measures differ by more than  $4^{mm}.0 \sqrt{K}$  (in which  $K$  is the distance leveled between adjacent bench marks in kilometers), both the forward and backward measures are to be repeated until two such measures fall within the limit.

10. If any measure over a section gives a result differing by more than 6 millimeters from the mean of all the measures over that section, this measure shall be rejected. No rejection shall be made on account of a residual smaller than 6 millimeters, unless there is some other good reason for suspecting an error in this particular measure, and in such cases the reason for rejection must be fully stated in the record.

11. Whenever a blunder, such as a misreading of 1 decimeter or 1 meter, or an interchange of sights (the backsight being recorded as a foresight), is discovered in any measure after its completion, and the necessary correction applied, such measure may be retained, provided there are at least two other measures over the same section which are not subject to any such uncertainty.

12. The programme of observation at each station is to be as follows: Set up and level the instrument. Read the three lines of the diaphragm as seen projected against the front (or rear) rod, each reading being taken to the nearest millimeter (estimated), and bubble being held continuously in the middle of the tube (i.e., both ends reading the same). As soon as possible thereafter read the three lines of the diaphragm as seen projected against the rear (or front) rod, estimating to millimeters as before, and holding the bubble continuously in the middle of the tube.

13. At each rod station the rod thermometer is to be read to the nearest centigrade degree and the temperature recorded.

14. At stations of odd numbers the backsight is to be taken before the foresight, and at even stations the foresight is to be taken before the backsight.

15. The maximum difference in length between a foresight and the corresponding backsight is to be 10 meters. The actual difference is to be made as small on each pair of sights as is feasible by the use of good judgment without any expenditure of time for this particular purpose.

16. The recorder shall keep a record of the rod intervals subtended by the extreme lines of the diaphragm on each backsight, together with their continuous sum between bench marks. A similar record shall be kept for the foresights. The two continuous sums shall be kept as nearly equal as is feasible without the expenditure of extra time for that purpose by setting the instrument beyond (or short of) the middle point between the back and front rods. The two continuous sums shall not be allowed to differ by more than a quantity corresponding to a distance of 20 meters.

17. Once during each day of observation the error of the level should be determined in the regular course of the leveling, and recorded in a separate opening of the record book as follows: The ordinary observations at an instrument station being completed, transcribe the last foresight reading as part of the error determination, call up the back rod and have it placed about 10 meters back of the instrument, read the rod, move the instrument to a position about 10 meters behind the front rod, read the front rod and then the back rod. The rod readings must be taken with the bubble in the middle of its tube. The required constant  $C$  to be determined, namely, the ratio of the required correction to any rod reading to the corresponding subtended interval, is:

$$C = \frac{(\text{sum of near rod readings}) - (\text{sum of distant rod readings})}{(\text{sum of distant rod intervals}) - (\text{sum of near rod intervals})}$$

The total correction for curvature and refraction must be applied to the sum of the distant rod readings before using it in this formula. The level should not be adjusted if  $C$  is less than 0.005. If  $C$  is between 0.005 and 0.010 the observer is advised not to adjust the level, but if  $C$  exceeds 0.010 the adjustment must be made. If a new adjustment of the level is made,  $C$  should at once be redetermined. It is desirable to have the determinations of level error made under the ordinary conditions as to length of sight, character of ground, elevation of line of sight above ground, etc. The level must be adjusted by moving the level vial, not by moving the reticle.

18. Notes for future use in studying leveling errors shall be inserted in the record, indicating the time of beginning and ending the work of each section, indicating the weather conditions, especially as to cloudiness and wind, indicating whether each section of the line is run toward or away from the sun, and such other notes as promise to be of value in studying errors.

19. The instrument shall be shaded from the direct rays of the sun, both during the observations and the movement from station to station.

20. The maximum length of sight shall be 150 meters, and the maximum is to be attained only under the most favorable circumstances.

21. At the beginning and end of the season, and at least twice each month during the progress of the leveling, the 3-meter interval between metallic plugs on the face of each level rod shall be measured carefully with a steel tape which shall be continuously kept in the party throughout the season for that purpose. The rod temperature at the time of each of these measures must be recorded. The purpose of these measures is to detect changes in lengths of the rod rather than to determine the absolute lengths. The absolute lengths are determined at the office between field seasons.

22. The field computations and abstracts are to be kept up as the work progresses. As soon as each book of the original record is out of use it is to be sent to the office by registered mail and the corresponding abstracts are to be retained in the field until you have been informed of the receipt of the original record.

23. No duplicates of the original records are to be made except of the descriptions of bench marks, of which duplicates in the form of carbon copies are to be made. At least once during each month such carbon copies as have accumulated are to be sent to the inspector of geodetic work.

24. At least once each month, during the progress of the leveling, you will test the adjustment of the rod levels and insert in the record a statement showing the manner in which the test was made, whether the error was found to be outside the limit stated below, and whether an adjustment was made. The test must determine the inclination of the rod to the vertical, measured in the plane of sight from the instrument to the rod, as well as at right angles to that plane, when the bubble of the level rod is held at the center. If the deviation from the vertical exceeds 10 millimeters on a 3-meter length of the rod, the rod level must be adjusted.

25. On the left-hand page of the record the number of each instrument station at which the instrument is not set up on the railroad track is to be included in a parenthesis. Similarly, on the right-hand page of the record, the designating letter for the foresight rod (V, W, etc.) shall be inclosed in a parenthesis if said rod is not supported on the railroad rail. If the portion of the level line which does not follow the rail is more than 25 meters longer than the distance along the track from the point of departure from the track to the point of return to the track, a note must be inserted in the record, showing the estimated distance and direction along the track between said point of departure and point of return. The purpose of these requirements is to furnish a means, for use at the office, of detecting an error of 1 meter in the leveling.

The principal changes in these instructions from those published on pages 213-215 of Appendix 3, Report for 1903, are:

First. It is required that the average distance between bench marks be not more than 5 kilometers, and it is indicated as desirable to make it much less. (See paragraph 2 of the general instructions.) The effect of this provision, which was inserted in October, 1903, was that, since that time, the average distance between bench marks has been 2.8 kilometers.

Second. A test of the adjustment of the rod level is required at least once each month. (See paragraph 24 of the general instructions.)

Third. A system is inaugurated in paragraph 25 by which the record shows when the rod is not held on the railroad rail and when the instrument is not set up on the railroad track. This is done so that in case a large blunder, as, for example, 1 meter, is found to exist in a line, a rapid test can be made of the leveling by plotting the profile of the railroad.

Other minor changes in the instructions, such as paragraphs 4 to 7, are not changes in practice. They represent former practice now incorporated in the requirements.

The form of records and method of computation with examples and tables are given fully on pages 216-222 of Appendix 3, Report for 1903.

## STATISTICS OF LINES.

The principal items of information in regard to the Coast and Geodetic Survey level lines are given in the tables below in the same form as the tables on pages 224-225 of Appendix 3, Report for 1903, arranged in such a manner as to be conducive to comparison between lines.

The number of permanent bench marks includes all with which the leveling was directly connected, regardless of whether they are new bench marks or bench marks previously established by some other party or organization.

The average distance between bench marks was obtained by dividing the total length of the main line by the number of permanent bench marks.

The speed was obtained by dividing the total length of the line by the interval in months from the date of the first leveling to the date of the last, inclusive. The expression "total length" refers to the completed line. Each completed section of the line was leveled at least twice, and in some cases four or more times. To obtain the speed in terms of single line one must therefore multiply the speed here given by a factor somewhat greater than two.

The discrepancy in millimeters per kilometer was obtained by dividing the total discrepancy on the main line by the length of the main line.

The probable error of the mean result for a section was computed by the formula

$$r'' = 0.674 \sqrt{\frac{\sum d^2}{4s}}$$

in which  $d$  is the discrepancy between the forward and backward leveling over a section and  $s$  is the number of sections. The probable error for 1 kilometer,  $r_1$ , was derived by assuming that the average length of a section is to 1 kilometer as  $(r'')^2$  is to  $r_1^2$ .

	Red Desert to Azusa, Wyo.	Ogden, Utah, to Azusa, Wyo.	Ogden, Utah, to Pocatello, Idaho.	Pocatello to Owyhee, Idaho.	Holland to New Braunfels, Tex.	Owyhee, Idaho, to Hunts Junction, Wash.	Seattle, Wash., to Hunts Junction, Wash.	St. Cloud to Watertown.	Watertown to Sioux City.
Observer.....	H. D. K.	R. L. L.	R. L. L.	H. D. K.	G. C. B. & F. H. S.	F. H. S.	G. C. B.	J. B. M.	J. B. M.
Instrument.....	7 and 5	8	8	7	8	8	7	6	8
Rods.....	T & U	R <sub>2</sub> & 8	R <sub>2</sub> & 8	T & U	R <sub>2</sub> & 8	R <sub>2</sub> & 8	V & W	T & U	T & U
Date of first leveling.....	May 20, 1903.	May 2, 1903.	Aug. 5, 1903.	Aug. 4, 1903.	Nov. 5, 1903.	May 5, 1903.	May 7, 1904.	July 6, 1904.	Apr. 17, 1905.
Date of last leveling.....	July 31, 1903.	July 31, 1903.	Sept. 28, 1903.	Oct. 24, 1903.	Feb. 16, 1904.	Oct. 4, 1904.	Oct. 1, 1904.	Nov. 5, 1904.	June 30, 1905.
Length of main line, km....	177	243	217	358	* 291	502	435	† 423	362
Length of side lines, km....	4	4	0	4	21	25	4	30	20
Total length, km.....	181	247	217	362	312	527	439	453	382
Total length, miles.....	112	153	135	225	194	327	273	281	237
Number permanent bench marks.....	34	34	27	55	80	184	131	161	168
Average distance between permanent B. Ms.....	5.2	7.1	8.0	6.5	3.6	2.7	3.3	2.8	2.3
Speed, km. per month.....	75	82	121	134	92	105	91	110	153
Speed, miles per month.....	47	51	75	83	57	65	57	69	95
Percentage run more than twice.....	28	24	17	15	22	23	17	28	15
Discrepancy (B-F), total, mm.....	+76.8	+14.7	-30.3	-58.5	-95.5	+65.6	-16.3	-6.2	-49.9
Discrepancy (B-F), in mm. per km.....	+0.43	+0.06	-0.14	-0.16	-0.41	+0.43	+0.04	-0.02	-0.14
Probable error for 1 km., in mm.....	±0.8	±0.8	±0.7	±0.7	±0.8	±0.9	±0.9	0.8	0.6
Velocipede cars used.....	Yes.	Yes.	† Yes.	Yes.	Yes.	Yes.	No.	Yes.	Yes.

\* Includes the branch line from Elgin to Austin and the Triangulation Station Barton, 57 km.

† Includes spur to Fairmount, length 16 kilometers. The length of the line from St. Cloud to Watertown is 407 kilometers.

‡ Except between McCammon and Pocatello.

	Baltimore.	Chicago Junction to Deshler.	Evansville to Stephen.	Chicago Junction to Deshler.	Smithville to Galveston.	Greenwich to Sullivan.	Ellwood City to Monaca.	Alliance to Struthers.
Observer.....	F. H. S.	F. H. S. & E. H. P.	E. H. P.	E. H. P.	E. H. P.	E. H. P.	E. H. P.	E. H. P.
Instrument.....	7	7	7	7	7	9	9	9
Rods.....	V & W	V & W	V & W	V & W	R <sub>4</sub> & S	T & U	T & U	T & U
Date of first leveling.....	Apr. 14, 1905.	Apr. 25, 1905.	June 17, 1905.	Oct. 31, 1905.	Dec. 9, 1905.	Sept. 19, 1906.	Sept. 28, 1906.	Oct. 9, 1906.
Date of last leveling.....	Apr. 18, 1905.	June 7, 1905.	Sept. 16, 1905.	Nov. 25, 1905.	Feb. 10, 1906.	Sept. 26, 1906.	Oct. 8, 1906.	Oct. 25, 1906.
Length of main line, km....	8	116	314	107	273	28	26	69
Length of side lines, km....	1	1	23	8	3	0	4	2
Total length, km.....	9	117	337	* 115	276	28	30	71
Total length, miles.....	6	73	209	* 71	171	17	19	44
Number permanent B. Ms.	10	54	96	50	100	18	15	33
Average distance between permanent B. Ms. in km.	0.8	2.1	3.3	2.1	2.7	1.6	1.7	2.1
Speed, km. per month.....	54	80	110	* 132	131	104	81	125
Speed, miles per month.....	34	50	68	* 82	81	63	51	78
Percentage run more than twice.....	32	26	10		12		31	11
Discrepancy (B-F), total, mm.....	- 0.7	-18.5	+22.2		-34.8	+ 4.8	+13.9	+16.4
Discrepancy (B-F), mm. per km.....	-0.09	-0.16	+0.07		-0.13	+0.17	+0.53	+0.24
Probable error for 1 km. in mm.....	± 0.7	± 0.8	± 0.6		± 0.7	± 0.7	± 0.8	± 0.7
Velocipede cars used.....	No.	No.	No.	No.	Yes.	No.	No.	No.

## SPEED, COST, AND ACCURACY OF RECENT PRECISE LEVELING.

Precise levels of the type described on pages 200-211 of Appendix 3, Report for 1903, have now been used on the equivalent† of 4 519 miles (7 272 kilometers) of completed line. The time used in this leveling, counted from the first to the last day of leveling on each line without any deduction, has been 69.7 months. The average rate of progress for a leveling party has therefore been 65 miles (104 kilometers) of completed line per month. The average rate of progress for a whole line has varied from 47 to 98 miles per month.‡ Every mile of progress represents a mile leveled at least twice, once in the forward and once in the backward direction. If the first two results on any section did not check within the specified narrow limit, the section was releveled in each direction, except as indicated in paragraph 11 of the instructions, page 12.

The following instances of unusually rapid leveling may now be added to those given on page 390 of Appendix 3, Report for 1903:

From June 24 to August 1, 1902, the observer completed the leveling between Chadron, Nebr., and Orin Junction, Wyo., 127 miles, at an average rate of progress of 98 miles per month.

From April 17 to June 30, 1905, the observer completed the leveling between Watertown, S. Dak., and Sioux City, Iowa, 237 miles, at an average rate of progress of 95 miles per month. The average sight during this season was unusually long, 94 meters.

In June, 1905, on the line Watertown, S. Dak., to Sioux City, Iowa, the observer completed 112 miles of line. The leveling was done in twenty-five days, and the

\* Of this, 63 km. was run only once. The total length of line is, therefore, equivalent to  $(52 + \frac{1}{2}) = 84$  kilometers of double line. The speed per month in terms of double line is 97 kilometers, or 60 miles.

† The aggregate length of all the leveling was 4 558 miles. Of this 80 miles was run in one direction only and is, therefore, counted as equivalent to 40 miles of completed double line.

‡ From the statement in this sentence there have been excluded a short line in Baltimore, Md., 6 miles, at the rate of 34 miles per month, and a short line, Temple to Holland, Tex., 17 miles, at the rate of 37 miles per month.

total length of single line was 242 miles, or an average of 9.7 miles of single line per observing day. Making no allowances whatever for any delays or interruptions except the stop in the middle of the day for lunch, the average number of hours of leveling was 7.0 per day, and the average speed, 1.4 miles of single line per hour during the progress of the leveling.

On the line Owyhee, Idaho, to Hunts Junction, Wash., on June 1, 1904, the observer ran 4 consecutive miles in one hour and thirty-five minutes, or at the rate of 2.5 miles per hour. One mile was run in nineteen minutes.

The costs per completed mile for certain of the lines run with the new instrument for which the facts are now obtainable are as follows:

	Cost per mile.
Dobbs Ferry to Greenbush, N. Y.; Chadron, Nebr., to Orin Junction, Wyo., and Rock Creek to Red Desert, Wyo.....	\$9.40
Fort Worth to Comanche, Lampasas, and Holland, Tex.....	9.10
Azusa, Wyo., to Pocatello, Idaho.....	10.70
Red Desert to Azusa, Wyo., and Pocatello to Owyhee, Idaho.....	11.60
Holland to New Braunfels, Tex.....	11.20
Owyhee, Idaho, to Hunts Junction, Wash.....	10.30
Seattle to Hunts Junction, Wash.....	11.20
Watertown, S. Dak., to Sioux City, Iowa.....	7.60
Baltimore, Md.; Chicago Junction to Deshler, Ohio, and Evansville to Stephen, Minn.....	10.30
Smithville to Galveston, Tex.....	8.50
Greenwich to Sullivan, Ohio; Ellwood City to Monaca, Pa., and Alliance to Struthers, Ohio....	9.90

The aggregate length of these lines is 2 889 miles. The average cost, per completed mile, is \$10.10 (\$6.30 per kilometer).

The variation in cost between the above lines is due to various causes. The weather conditions varied greatly. On some lines the party lived at convenient hotels and boarding houses, and on others in a camp or in a car, and were forced frequently to go a considerable distance to the work. Velocipede cars were used on some lines and tended to reduce the cost. Some of the lines were run on steep grades, through mountainous regions. On the later lines the permanent bench marks were placed at an average interval less than one-half as great as on the earlier lines, and this tended to produce an appreciable increase in the cost per mile.\* The average rate of pay of the party was somewhat higher on lines in the far west than on the other lines. Differences in both the observing and party management of different chiefs of party produced variations in cost, which were large in exceptional cases.

The above figures represent the actual cost of the leveling, including the establishment of the bench marks, with the exception of the cost of the instruments and stationery. It includes the transportation to and from the field paid by the Government and all wages and salaries, including those of the chief of party and recorder. The salary of each member of the permanent field force is charged to the leveling for the whole period during which he was engaged upon work incidental to the leveling, including the time spent in travel to and from the field, the time spent in preparing for the field and in completing field reports and records and computations at the end of the season. One-eleventh has been added to the

\* On the leveling in 1899-1903 the average distance between permanent bench marks was more than 6 kilometers. On the leveling in 1904-1906 it was less than 3 kilometers.

salary actually paid each officer during the time he was connected with the leveling, to take account of the fact that the Government pays its permanent employees twelve months' salary for eleven months' work upon an average.

In Appendix 3, Report for 1903, page 391, the average cost per mile of various lines run with this instrument and method is given as \$8.70. The slight increase in cost per mile, from \$8.70 for the earlier lines to \$10.10 for the later lines, as given above, is believed to be due mainly to two causes. In the later lines the permanent bench marks are closer together, as already indicated, the party pay was somewhat higher and the traveling expenses greater, on an average, because a greater percentage of these lines was in the far west.

In spite of the greater average difficulties encountered on the later lines, the average rate of progress has been the same as for the earlier lines for which the statistics are given in Appendix 3, Report for 1903, pages 223-225.

The probable error of a single kilometer of completed leveling, as computed from the divergencies between the forward and backward lines, has ranged from  $\pm 0.6$  millimeter to  $\pm 0.9$  millimeter and the average has been  $\pm 0.7$  millimeter. This is the internal evidence of each separate line. The probable error of a single kilometer of completed leveling derived from the adjustment of the level net is  $\pm 0.67$  millimeter (page 73). This is the evidence from the level net as a whole. Each line is tested in the level net adjustment by other lines, that is, by the external evidence. The fact that both the internal and external evidence agree in making the probable error  $\pm 0.7$  millimeter for 1 kilometer indicates that there are no systematic errors peculiar to each line, or, in other words, that all the errors belong in the accidental class.

There is, however, an indication of systematic error in the particular line of levels between Chicago Junction and Deshler, Ohio. In the table on page 32 the elevations of the bench marks along this line as determined separately in the spring and in the fall of 1905 are given. The difference between the two determinations of the difference of elevation between the end bench marks is 78.4 millimeters, which is more than five times the probable error of this difference (see page 33). The two lines showed an increase in divergence from each other from one end to the other. The divergence is much too large to be accounted for by an error in the determination of rod lengths. It is a clear indication of a systematic error of about 0.7 millimeter per kilometer.

The only other lines run by the present method on which similar extensive tests by rerunning are available are the two lines, Gibraltar, Mich., to Cincinnati, Ohio, and Decatur, Ala., to Tuscumbia, Miss.

On the line Gibraltar-Cincinnati, run with an instrument closely resembling the present type of instrument, three loops of single line were run, the distances around the loops being from 82 to 112 kilometers.\* The closures of these circuits, each less than 10 millimeters, indicated that the accidental errors were unusually small, and that no systematic errors existed.

The line Decatur-Tuscumbia had been leveled originally under the direction of the Corps of Engineers, U. S. Army, and was of the best grade of Kern leveling.

\* See page 339 of Appendix 7, Report for 1899.

such as is given the weight  $\frac{500}{L}$  in the present adjustment. The line was rerun in 1901 by the Coast and Geodetic Survey with the present instrument and methods. "The very close agreement of the old and new lines from Decatur to Iuka, 124 kilometers over the new line, the difference, 1901-1895, being over this whole distance always within 9 millimeters of 0.3160 meters, indicates both level lines to have been of an extremely high grade of accuracy."\* It indicated not only that the accidental errors were unusually small, but also that the observed results contain little or no effect of systematic errors.

The evidence from these two lines offsets that from the line Chicago Junction to Deshler.

The adjustment of the level net furnishes a still more searching test for possible systematic errors in the new leveling, because it involves many lines. In the adjustment the weights have been assigned to this leveling upon the supposition that the errors are all of the accidental class. They are therefore made inversely proportional to the length of the line, as if the accumulated error increased as the square root of the length of the line run. If a part of the errors are systematic and therefore tend to increase as the first power of the length of the line, instead of its square root, the quantities  $pv^2$  will tend to be much larger for very long lines than for short lines. Accordingly, the following table has been prepared † in which all of the equations involved in the adjustment which are based wholly or almost wholly upon Coast and Geodetic Survey leveling with the present instruments and methods are placed in order of weight; that is, with the longest line first.

The equation numbers are the same as those shown on page 68. In the quantity  $pv^2$ ,  $v$  is the correction in millimeters applied to the observed difference of elevation to satisfy all conditions—that is, to close all circuits in the level net, including those involving connections with mean sea level—and  $pv^2$  is the square of this correction multiplied by the weight. The last column gives the correction  $v$  as expressed in millimeters per kilometer.

Equation No.	Line.	Length.	Weight $p$ .	$pv^2$ .	Correction in mm. per km.
		km.		mm.	
58.....	Cheyenne-Seattle.....	2 315	1.3	4 268	+ .025
61.....	St. Paul-Sioux City.....	893	‡ 2.0	3 629	— .048
57.....	Cheyenne-Norfolk.....	978	3.1	1 771	— .024
64.....	Abilene-Fort Worth.....	755	4.0	864	— .019
66.....	Fort Worth-Galveston.....	616	4.9	1 535	— .029
22E.....	Abilene-Norfolk.....	466	6.4	615	+ .021
36B.....	Cincinnati-Harriman Junction.....	412	7.3	221	— .013
65.....	Fort Worth-Shreveport.....	410	7.3	105	+ .009
35D.....	Deshler-Cincinnati.....	272	11	370	— .021
36I.....	Chattanooga-Decatur.....	196	15	34	+ .006
56.....	Denver-Cheyenne.....	169	18	0	+ .000
35C.....	Trenton-Deshler.....	131	23	10	— .016
36H.....	Harriman Junction-Chattanooga.....	128	23	19	+ .007
54B.....	Greenbush-Poughkeepsie.....	116	26	192	+ .022
59.....	Norfolk-Sioux City.....	116	26	6	— .004
54C.....	Poughkeepsie-Sandy Hook.....	87	34	76	+ .017
36C.....	Knoxville-Harriman Junction.....	81	37	9	+ .006
16B.....	Tusculum-Corinth.....	86	§ 40	10	— .006
16D.....	Decatur-Tusculum.....	72	42	60	— .017
87.....	Ellwood City-Monaca.....	26	115	10	+ .012

\* See page 289 of Appendix 3, Report for 1903.

† In the same form as the tables on pp. 445 and 447 of Appendix 8, Report for 1899.

‡ Mixed line, 1/6 Mississippi River Commission.

§ Mixed line, of which 75 kilometers was also run by Corps of Engineers, U. S. Army.

The average  $pv^2$  for lines more than 400 kilometers long is much greater than for the shorter lines, indicating clearly that the leveling is subject to some systematic error. The last column shows, however, that this systematic error is probably less than 0.020 millimeter per kilometer on an average, for there are 13 of the 20 lines on which the total correction due to both accidental and systematic errors is less than 0.020 millimeter per kilometer.

The evidence as a whole indicates that the precise leveling of the Coast and Geodetic Survey with the present instrument and methods is subject on an average to an accidental error of  $\pm 0.67$  millimeter in each kilometer of completed line and to a systematic or cumulative error which is probably less, on an average, than 0.020 millimeter per kilometer.

#### RED DESERT, WYO., TO OWYHEE, IDAHO.

The details in regard to this line and the resulting elevations and descriptions of bench marks are published in Appendix 6, Report for 1904, "Precise Leveling from Red Desert, Wyo., to Owyhee, Idaho, 1903." The tables of elevation are also given in Appendix 4, Report for 1905, "Precise Leveling from Red Desert, Wyo., to Seattle, Wash., 1903-4." The statistics of the line in its four sections are repeated in a preceding table. All elevations in the two publications mentioned are superseded by those given in this publication, which depend on the new adjustment.

#### HOLLAND TO NEW BRAUNFELS, TEX.

The details in regard to this line and the resulting elevations and descriptions of bench marks are published in Appendix 7, Report for 1904, "Precise leveling from Holland to New Braunfels, Tex., 1903." The statistics of this line are repeated in a preceding table. The elevations given in Appendix 7, Report for 1904, are the same as those in this publication.

#### OWYHEE, IDAHO, TO SEATTLE, WASH.

The details in regard to this line and the resulting elevations and descriptions of bench marks are published in Appendix 4, Report for 1905, "Precise Leveling from Red Desert, Wyo., to Seattle, Wash., 1903-4." The statistics of this line, in its two sections, are repeated in a preceding table. The elevations in Appendix 4, Report for 1905, are superseded by those given in this publication, which depend on the new adjustment.

#### ST. CLOUD, MINN., TO WATERTOWN, S. DAK.

This line was run by J. B. Miller, Aid (with the exception that during the month of July one-half the observing was done by R. L. Libby, Aid), between July 6 and November 5, 1904. The line was started from three bench marks of the Mississippi River Commission at St. Cloud, Minn. To Fairmount, N. Dak., the line followed the Great Northern Railway. At Fairmount connection was made with three bench marks of the United States Geological Survey. From Fairmount to Twinbrooks, Minn., the line followed the Chicago, Milwaukee and St. Paul Railway. At Ortonville connection was made with three bench marks of the Corps of Engineers, U. S.



Army. From Twinbrooks to Southshore the leveling ran across the country, and thence it followed the Great Northern Railway to Watertown, S. Dak.

The leveling determined the elevations of six primary triangulation stations. Osakis, Alexandria, Elbow, Foss, Oscarson, and Mound.

Velocipede cars were used on the line. Level No. 6, one of the intermediate type described on page 418 of Appendix 8, Report for 1899, was used.

Rods T and U were used. Their lengths, at 0° C., as determined by the National Bureau of Standards, before and after the leveling, were:

	Rod T.	Rod U.
	<i>m.</i>	<i>m.</i>
January 9, 1904.....	3.0010	3.0009
January, 1905.....	3.0015	3.0014

In accordance with paragraph 21 of the general instructions each rod was measured with a steel tape at least twice each month while in the field. These measures failed to show when the change found by the Bureau of Standards occurred. A mean therefore of the two measurements, 3.0012 meters, or an excess of 0.40 millimeter per meter, was used in the computation of the line. The index correction of rod T was -0.64 millimeter and of rod U was -0.66 millimeter.

The direct results of the leveling are shown in the following tables, in which all the permanent bench marks are given. The new differences of elevations between the three bench marks established by the Mississippi River Commission at St. Cloud agreed with the differences as formerly determined within the limit of accuracy of the leveling.

If no distance is given in the fourth column, the bench mark is in the main line of levels. If a distance is given in the fourth as well as the third column, the bench mark is on a spur and the distance given in the fourth column shows the point at which the spur branches from the main line.

The elevations are based on an elevation for P. B. M. St. Cloud of 314.8890 meters, being the adjusted elevation published on page 493 of Appendix 3, Report for 1903.

*Results of leveling, St. Cloud, Minn., to Watertown, S. Dak., 1904.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		<i>km.</i>	<i>km.</i>	<i>mm.</i>	<i>m.</i>
St. Cloud, Minn.	P. B. M. St. Cloud...	0.0	...	0.0	314.8890
East St. Cloud, Minn.	P. B. M. 2½"	1.0	0.0	1.7	308.5818
Do.	P. B. M. 3½", top of cap...	1.0	0.0	1.8	309.7913
Do.	Hydrant 1...	2.4	0.0	+2.8	316.3989
St. Cloud, Minn.	P. B. M. 2½"	5.8	0.0	-2.5	312.7007
Do.	P. B. M. 2½", top of cap ‡	5.8	0.0	-1.9	313.9608
Do.	P. B. M. 2½", top of cap §	5.8	0.0	-1.9	313.9817
Do.	A.	0.3	0.3	+0.5	316.6509
Do.	Hydrant 2	0.9	0.3	+0.5	316.1770

\* From P. B. M. St. Cloud at St. Cloud, Minn.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

‡ As found.

§ In new position.

*Results of leveling, St. Cloud, Minn., to Watertown, S. Dak., 1904—Continued.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
St. Cloud, Minn.	Hydrant 3.	1.2	0.3	+ 1.2	316.0916
Do.	Hydrant 4.	1.1	0.3	+ 1.7	316.9620
Do.	B.	1.7	1.7	- 0.1	319.9148
Near St. Cloud, Minn.	C.	5.9		+ 6.9	319.6454
Do.	D.	6.4		+ 3.9	318.2137
St. Joseph, Minn.	E.	12.5		- 1.0	332.4884
Collegeville, Minn.	F.	17.8		- 5.3	334.2080
Do.	G.	17.9	17.8	- 4.7	333.9391
Near Avon, Minn.	H.	23.3		- 7.0	344.9435
Avon, Minn.	I.	23.7		- 3.1	345.2387
Do.	J.	23.7	26.7	- 2.4	344.6061
Near Albany, Minn.	K.	33.2		-14.4	360.9858
Albany, Minn.	Hydrant 5.	36.7		-17.8	368.4362
Do.	L.	36.8	36.7	-18.5	367.9582
Freeport, Minn.	M.	46.2		-11.2	378.2109
Do.	N.	47.2		-10.8	379.3141
Near Melrose, Minn.	Hydrant 6.	47.2	47.2	-10.8	380.0324
Melrose, Minn.	O.	54.0		- 3.3	360.4074
Do.	P.	56.7		- 4.5	369.3670
Do.	City 1.	56.8		- 4.4	370.2112
Do.	City 2.	57.1	56.8		370.2302
Do.	City 3.	57.3	56.8		370.3592
Do.	City 4.	58.0	56.8		369.9424
Do.	Q.	57.9		- 4.9	368.2144
Near Melrose, Minn.	R.	60.7		- 7.9	369.7453
Near Sauk Center, Minn.	S.	67.4		- 6.3	382.2617
Sauk Center, Minn.	T.	70.7		-14.7	383.7769
Do.	U.	70.9		-15.4	384.0151
Do.	Hydrant 7.	71.0	70.9	-16.1	383.0913
Do.	Hydrant 8.	71.2	70.9	-16.1	381.9347
Do.	Hydrant 9.	71.4	70.9	-18.1	381.3307
Near West Union, Minn.	V.	79.4		-20.5	391.8569
West Union, Minn.	W.	83.7		-29.4	406.4823
Do.	X.	83.8	83.7	-29.6	408.7928
Near West Union, Minn.	Y.	84.3		-27.1	408.3913
Near Osakis, Minn.	Z.	89.7		-28.4	414.5885
Do.	A.	92.9	89.9	-37.7	424.5565
Do.	Osakis Triangulation Sta.	93.3	89.9	-35.2	428.3259
Osakis, Minn.	B.	93.1		-30.7	410.0337
Do.	C.	93.5		-30.7	412.1094
Do.	D.	93.6		-31.4	410.6307
Near Osakis, Minn.	E.	96.0		-27.2	423.4969
Near Nelson, Minn.	F.	101.1		-28.9	411.9119
Nelson, Minn.	G.	102.8	102.8	-34.3	417.2135
Near Alexandria, Minn.	Alexandria Triangulation Sta.	111.0	109.8	-42.4	461.1739
Do.	Alexandria Ref. Mark.	111.1	109.8	-41.8	450.6767
Do.	H.	109.8		-40.5	431.6052
Alexandria, Minn.	I.	111.8		-41.2	424.1928
Do.	J.	112.0	111.8	-39.9	424.6994
Do.	K.	112.4	111.8	-40.2	428.2314
Do.	Alexandria Magnetic Sta.	112.7	111.8	-39.5	428.8066
Do.	L.	112.9	111.8	-39.1	431.6589
Do.	City.	112.9	111.8	-39.1	431.2801
Near Garfield, Minn.	M.	118.2	118.2	-52.4	423.4826
Garfield, Minn.	N.	122.8	122.7	-50.6	433.8416
Near Brandon, Minn.	O.	127.0		-57.7	430.6547
Do.	P.	128.9		-57.9	430.4562
Do.	Q.	129.6		-57.3	432.3298
Brandon, Minn.	R.	132.1		-56.4	423.0733
Evansville, Minn.	S.	140.7	140.5	-52.0	414.5838
Do.	T.	140.8	140.5	-51.0	414.5425
Erdahl, Minn.	U.	152.1	152.0	-50.2	385.9993
Thorsborg, Minn.	V.	159.3	159.1	-59.7	367.1665
Near Elbow Lake, Minn.	Elbow Triangulation Sta.	165.7	161.8	-54.8	389.9826
Do.	W.	162.1		-58.7	372.6947
Elbow Lake, Minn.	X.	165.7	164.2	-53.2	369.8899
Do.	Y.	165.7	164.2	-53.5	369.7657
Near Elbow Lake, Minn.	Z.	164.2		-57.7	366.7002
Do.	A.	167.6	167.4	-56.7	363.3154
Near Hereford, Minn.	B.	176.1		-52.7	344.3497
Do.	C.	183.4	183.4	-59.8	313.8652
Tintah, Minn.	D.	193.9		-73.4	304.0541
Do.	E.	194.1		-72.4	305.2964
Near Tintah, Minn.	F.	197.1		-67.8	302.3104
Near Yarmouth, Minn.	G.	202.3		-63.0	300.6481
Do.	H.	207.7		-51.5	299.3846
Childs, Minn.	I.	214.2		-40.3	297.4087

\* From P. B. M. St. Cloud at St. Cloud, Minn.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

## Results of leveling, St. Cloud, Minn., to Watertown, S. Dak., 1904—Continued.

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Fairmount, N. Dak.	A.	220.0		-45.5	300.0752
Do.	B.	224.9		-38.6	297.6521
Do.	† 979 W.	227.4	220.0	-38.6	298.8573
Do.	§ 979 W.	227.5	220.0	-38.5	298.6244
Do.	§ 71 W.	229.0	220.0	-30.0	298.0176
Near Childs, Minn.	Foss Triangulation Sta.	230.9	220.0	-27.6	297.1332
Do.	Foss Ref. Mark.	230.9	220.0	-27.9	297.2309
Do.	J.	232.3	220.0	-26.9	295.8752
Near Fairmount, N. Dak.	969 W.	235.6	220.0	-23.0	295.6418
Fairmount, N. Dak.	C.	221.3	221.1	-43.7	300.4883
Do.	D.	221.4	221.1	-44.1	300.4147
Near Blackmer, N. Dak.	E.	229.2		-34.0	296.8403
Do.	F.	232.3		-30.8	297.3518
Do.	G.	233.6		-31.1	297.1489
White Rock, S. Dak.	A.	237.2		-35.5	297.4529
Do.	B.	237.4		-35.5	297.8067
Do.	C.	237.7		-35.1	296.8194
Near White Rock, S. Dak.	K.	239.2		-33.5	302.1093
Do.	L.	240.5		-30.3	307.3975
Near Wheaton, Minn.	M.	243.0		-29.0	316.0368
Near White Rock, S. Dak.	Oscarson Triangulation Sta.	245.0	243.0	-32.1	317.4524
Do.	Oscarson Ref. Mark.	245.0	243.0	-31.8	316.6261
Wheaton, Minn.	N.	252.6		-22.8	311.1813
Do.	City.	252.8		-22.8	311.0856
Do.	O.	252.9		-22.4	311.2731
Near Wheaton, Minn.	P.	257.6		-18.9	312.3916
Near Dumont, Minn.	Q.	262.8		-21.8	317.3422
Dumont, Minn.	R.	264.4		-17.4	319.2068
Do.	S.	264.5		-16.3	317.6250
Near Dumont, Minn.	T.	269.6		-21.3	320.7710
Collis, Minn.	U.	272.7		-26.8	324.9749
Near Collis, Minn.	V.	274.5		-27.2	326.5058
Near Graceville, Minn.	W.	276.2		-26.0	329.3933
Do.	X.	277.8		-30.5	335.7062
Graceville, Minn.	City.	281.7		-24.8	339.1187
Do.	Y.	281.4		-25.4	338.7832
Do.	Z.	281.8		-25.0	339.0798
Do.	A.	282.2		-24.7	337.9661
Near Graceville, Minn.	B.	283.7		-24.6	338.8526
Do.	C.	288.4		-23.6	348.4499
Do.	D.	290.3		-20.6	352.9513
Near Clinton, Minn.	E.	292.0		-16.8	361.2363
Clinton, Minn.	F.	295.0		-21.1	354.3458
Do.	G.	295.1		-21.2	354.4508
Near Clinton, Minn.	H.	297.2		-17.7	349.7228
Near Ortonville, Minn.	I.	305.4		-20.0	351.9933
Do.	J.	309.0		-27.4	339.5182
Do.	K.	310.5		-26.2	336.5328
Ortonville, Minn.	L.	313.0		-19.6	311.7161
Do.	U. S. E. 1.	313.8		-22.4	298.5367
Do.	U. S. E. 2.	313.9		-21.4	295.4949
Do.	U. S. E. 3.	314.3		-20.2	296.2620
Near Bigstone City, S. Dak.	D.	317.3		-22.9	296.9516
Do.	F.	320.8		-22.5	320.1672
Do.	F.	322.2		-19.4	319.9590
Near Milbank, S. Dak.	G.	325.2		-11.6	324.8063
Do.	H.	333.7		+ 5.7	349.5011
Milbank, S. Dak.	I.	334.6		+ 8.8	350.9072
Near Milbank, S. Dak.	J.	336.9		+ 6.5	350.8781
Near Twinbrooks, S. Dak.	K.	345.0		+ 7.0	377.9558
Twinbrooks, S. Dak.	L.	346.7		+ 6.4	384.8317
Stockholm, S. Dak.	M.	360.7		+12.0	507.2414
Southshore, S. Dak.	N.	372.7		+14.6	567.9849
Do.	O.	372.9		+14.7	570.3056
Near Southshore, S. Dak.	Mound Triangulation Sta.	377.4		+12.7	634.7571
Do.	Mound Ref. Mark.	377.5		+12.2	628.0448
Near Forestville, S. Dak.	P.	382.0		+10.7	578.5206
Near Watertown, S. Dak.	Q.	393.1		- 6.3	544.0300
Do.	R.	400.5		- 0.3	530.4141
Do.	S.	404.1		- 4.7	528.9493
Watertown, S. Dak.	T.	406.3		- 6.0	530.5563
Do.	City 1.	406.5		- 5.9	530.8433
Do.	U.	406.7		- 6.2	529.3034
Do.	City 2.	406.6	406.3	- 4.3	530.7187
Do.	Watertown Magnetic Sta.	406.7	406.3	- 4.4	528.7458

\* From P. B. M. St. Cloud at St. Cloud, Minn.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

‡ As found.

§ Reset.

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.	Distance.	B-F.	B-F per kilometer.
<i>km.</i>	<i>mm.</i>	<i>mm.</i>	<i>km.</i>	<i>mm.</i>	<i>mm.</i>
8.2	+ 8.1	+0.99	192.2	-74.9	-0.39
36.7	-17.8	- .49	359.2	+16.5	+ .04
120.9	-58.2	- .48	At end 406.7	- 6.2	- .02

The following elevations for the top of the rail in front of each of the railroad stations, unless otherwise stated, were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad stations, St. Cloud, Minn., to Watertown, S. Dak.*

	Meters.		Meters.
St. Cloud, Minn.....	318.34	Tintah, Minn.....	304.73
St. Joseph, Minn.....	331.93	Crossing of Minnesota, St. Paul and Sault	
Collegeville, Minn.....	334.15	Ste. Marie Railway.....	303.07
Avon, Minn.....	334.94	Yarmouth, Minn.....	301.87
Albany, Minn.....	366.38	Childs, Minn.....	298.38
Freeport, Minn.....	378.27	Fairmount, N. Dak.....	300.39
Melrose, Minn.....	369.20	Blackmer, N. Dak.....	297.00
Sauk Center, Minn.....	382.47	White Rock, S. Dak.....	297.19
West Union, Minn.....	407.87	Wheaton, Minn.....	311.12
Osakis, Minn.....	410.13	Dumont, Minn.....	317.89
Nelson, Minn.....	417.54	Collis, Minn.....	326.91
Geneva, Minn.....	421.44	G. N. Crossing, Minn.*.....	339.22
Alexandria, Minn.....	424.33	Graceville, Minn.....	338.98
Garfield, Minn.....	431.81	Batavia, Minn.....	354.41
Brandon, Minn.....	423.10	Ortonville, Minn.....	301.73
Evansville, Minn.....	412.83	Bigstone City, S. Dak.....	297.09
Erdahl, Minn.....	386.53	Milbank, S. Dak.....	349.68
Thorsborg, Minn.....	368.14	Sisseton Branch, S. Dak.†.....	349.58
Elbow Lake, Minn., Minnesota, St. Paul		Twinbrooks, S. Dak.....	384.26
and Sault Ste. Marie Railway station ...	368.97	Stockholm, S. Dak.....	504.17
Elbow Lake, Minn., Great Northern Rail-		Southshore, S. Dak.....	568.03
way station .....	364.85	Forestville, S. Dak.....	568.85
Hereford, Minn.....	330.69	Ranville, S. Dak.....	535.23

#### WATERTOWN, S. DAK., TO SIOUX CITY, IOWA.

This line was run by J. B. Miller, Aid, between April 17 and June 30, 1905. Five bench marks established the previous year in Watertown were recovered. The leveling follows the Great Northern Railway from Watertown to Vienna, S. Dak., and the Chicago, Milwaukee and St. Paul Railway through Madison and Sioux Falls Junction to Sioux City, Iowa, where three bench marks of the Missouri River Commission, already in the level net, were recovered. Connection was also made

\* At junction of Chicago, Milwaukee and St. Paul Railroad and Great Northern Railroad, Graceville, Minn.

† On spur, Sisseton branch of Chicago, Milwaukee and St. Paul Railroad, Milbank, S. Dak.

with Triangulation Stations Crane and Hansen; with three other bench marks of the Missouri River Commission, near Jefferson, S. Dak., on a line not included in the net; with three bench marks of the United States Geological Survey near Harrisburg, S. Dak.; with city bench marks in several towns and with a number of stones marking land section corners. Velocipede cars were used except from Watertown to Vienna, 25 miles.

Level No. 8 and rods T and U were used. The lengths of these rods at 0° C., as determined by the Bureau of Standards, before and after the leveling, were:

Date.	Rod T.	Rod U.
January, 1905.....	m. 3.0015	m. 3.0014
October, 1906.....	3.0020	3.0015

Measurements of the rods with a steel tape were made in the field, in accordance with paragraph 21 of the general instructions, and indicated that the change shown above occurred near the end of the season. The values of January, 1905, were therefore adopted in the computation of the line. The index correction of rod T was -0.67 millimeter and of rod U was -0.64 millimeter.

The direct results of the leveling are shown in the following tables, in which all the permanent bench marks are given.

The differences of elevation between the five bench marks at Watertown, determined by the new leveling, agreed with the differences between the same bench marks determined in 1904, within the limit of accuracy of the leveling.

If no distance is given in the fourth column, the bench mark is in the main line of levels. If a distance is given in the fourth as well as the third column, the bench mark is on a spur, and the distance given in the fourth column shows the point at which the spur branches from the main line.

The elevations are based on an elevation for U, at Watertown, of 529.3034 meters, as determined by the line St. Cloud to Watertown, and that elevation depended on the 1903 adjusted elevations at St. Cloud.

At Sioux City three bench marks of the Missouri River Commission were recovered, one of which had been also determined by the Coast and Geodetic Survey in 1899 on the line Norfolk to Sioux City. In the adjustment of the level net in 1903 a local adjustment was made of the leveling in Sioux City, and a mean was taken of two values of the difference between P. B. M. 399 and B<sub>1</sub>, as determined by a combination of Missouri River Commission leveling and Coast and Geodetic Survey leveling. (See page 365 of Appendix 3, Report for 1903.) The determination of this difference by the Coast and Geodetic Survey leveling only, from the lines Norfolk to Sioux City and Watertown to Sioux City, connecting on the cap of P. B. M. 397, differed only 8.6 millimeters from the difference adopted in 1903. This difference was, therefore, not changed. The elevations of the intermediate bench marks were adopted as determined by the two Coast and Geodetic Survey lines, corrected to fit the adopted difference of elevation, P. B. M. 399 - B<sub>1</sub> = -1.0846 meters.

*Results of leveling, Watertown, S. Dak., to Sioux City, Iowa, 1905.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Watertown, S. Dak.	U	0.0		0.0	529.3034
Do.	T	0.3	0.0	+ 0.5	530.5573
Do.	Watertown Magnetic Sta.	0.1	0.0	+ 0.6	528.7462
Do.	City 2	0.2	0.0	+ 0.3	530.7184
Do.	City 1	0.4	0.0	- 1.3	530.9450
Do.	V	1.3		+ 1.2	523.8739
Near Grover, S. Dak.	W	14.3		- 3.3	532.6604
Grover, S. Dak.	X	16.2		+ 0.2	530.7217
Near Grover, S. Dak.	Y	21.3		- 4.2	523.7657
Hazel, S. Dak.	Z	27.1		- 4.7	538.8617
Do.	A	27.1		- 5.9	538.8019
Do.	B	27.3		- 5.9	536.7096
Near Hazel, S. Dak.	C	30.1		- 3.6	546.6060
Do.	D	33.3		- 3.2	546.2835
Near Vienna, S. Dak.	E	36.0		- 1.4	546.3384
Do.	F	37.8		- 0.9	558.0660
Vienna, S. Dak.	G	38.5		- 1.3	558.0688
Near Vienna, S. Dak.	H	42.3		+ 2.5	554.0860
Near Bryant, S. Dak.	I	49.9		+ 2.0	558.6443
Do.	J	50.2		+ 2.2	558.7630
Do.	S. C. 1	50.7		+ 0.9	562.7976
Bryant, S. Dak.	K	52.0		+ 1.8	562.2720
Do.	L	52.2		+ 1.6	564.6241
Near Bryant, S. Dak.	M	53.4		+ 1.6	567.7975
Do.	S. C. 2	55.9		+ 1.5	547.0811
Erwin, S. Dak.	N	64.6		- 9.5	568.0226
Near Erwin, S. Dak.	O	66.5		- 11.3	561.1435
Do.	P	68.3		- 8.5	550.4891
Near Lake Preston, S. Dak.	Q	77.8		- 7.1	519.3652
Lake Preston, S. Dak.	R	80.2		- 12.1	525.5900
Do.	S	80.4		- 12.0	524.3384
Do.	Preston	80.7		- 11.7	524.2966
Near Lake Preston, S. Dak.	T	82.0		- 14.5	523.5548
Do.	U	87.4		- 13.0	516.1344
Do.	S. C. 3	88.5	87.4	- 10.4	522.4833
Do.	Hansen Triangulation Sta.	91.4	87.4	- 0.3	529.4561
Do.	Hansen Ref. Mark	91.6	87.4	+ 0.1	527.2485
Oldham, S. Dak.	V	97.7		- 10.1	524.7033
Do.	W	98.0		- 8.6	526.4999
Near Oldham, S. Dak.	X	100.1		- 6.9	527.0943
Do.	Y	102.9		- 1.5	527.5333
Ramona, S. Dak.	Z	113.7		- 1.1	549.8832
Near Ramona, S. Dak.	A	113.9		- 1.1	549.0670
Do.	B	114.9		+ 0.2	548.3860
Do.	C	117.8		- 2.2	541.9363
Do.	D	122.0		- 7.4	529.9253
Do.	S. C. 4	123.4	122.0	- 1.3	527.3161
Do.	S. C. 5	125.1	122.0	+ 3.2	539.4831
Do.	S. C. 6	126.7	122.0	+ 5.7	547.7737
Do.	E	128.2	122.0	+ 5.0	563.7927
Do.	S. C. 7	129.8	122.0	+ 5.7	568.8579
Do.	Crane Ref. Mark	133.1	122.0	+ 9.8	553.4435
Do.	Crane Triangulation Sta.	133.7	122.0	+ 9.4	565.6989
Near Madison, S. Dak.	F	126.9		- 14.3	528.5351
Madison, S. Dak.	G	129.0		- 15.4	513.5113
Do.	H	130.3		- 7.9	510.3205
Do.	I	130.4	130.3	- 8.3	511.1399
Do.	City 2	130.5	130.3	- 8.6	509.6927
Do.	City 3	130.3		- 8.6	509.4736
Near Madison, S. Dak.	J	134.1		- 14.5	521.5461
Do.	K	136.0		- 14.1	520.0748
Wentworth, S. Dak.	L	142.1		- 11.1	516.8300
Do.	M	142.7		- 9.4	516.3142
Near Wentworth, S. Dak.	N	144.4		- 10.9	512.3100
Colman, S. Dak.	O	155.0		+ 0.7	517.1125
Near Colman, S. Dak.	P	158.3		- 2.4	517.7354
Do.	Q	159.3		- 3.8	524.4044
Do.	R	160.6		- 2.2	512.8568
Do.	S	161.4		- 0.2	506.0105
Near Egan, S. Dak.	T	168.0		+ 5.4	461.6358
Do.	U	171.8		+ 6.3	461.0129
Near Trent, S. Dak.	S. C. 8	173.4		+ 5.6	458.3989
Trent, S. Dak.	V	175.6		+ 6.4	457.4740
Near Trent, S. Dak.	W	179.5		+ 4.7	454.4089
Dell Rapids, S. Dak.	X	186.9		+ 9.3	456.4423
Do.	City 1	187.0		+ 10.0	457.4987

\* From U, at Watertown, S. Dak.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

Results of leveling, Watertown, S. Dak., to Sioux City, Iowa, 1905—Continued.

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Dell Rapids, S. Dak.	Y.	187.1		+ 8.2	457.0108
Do.	City 2	187.1		+ 8.3	457.1910
Do.	Z.	187.5		+ 7.3	453.9774
Near Dell Rapids, S. Dak.	A.	188.8		+ 9.9	454.9503
Do.	B.	190.4		+10.0	450.2333
Do.	S. C. 9	192.0		+ 9.0	449.3096
Baltic, S. Dak.	C.	195.5		+14.6	449.2508
Near Baltic, S. Dak.	D.	197.0		+16.5	445.0894
Do.	E.	198.7		+13.2	443.3216
Do.	F.	199.9		+13.6	442.6277
Rennar, S. Dak.	G.	208.3		+19.6	438.4030
Do.	H.	208.4		+19.3	437.8394
Near Sioux Falls, S. Dak.	I.	214.9		+21.3	434.1489
Do.	J.	216.5		+18.6	433.4261
Sioux Falls, S. Dak.	City 1	219.0		+17.9	428.0957
Do.	City 2	219.4		+18.3	427.6378
Do.	City 4	219.5	219.4	+18.6	427.2682
Do.	L.	219.6		+18.7	428.7372
Do.	City 3	219.8		+18.4	430.5378
Do.	U. S. G. S. Ast. Sta.	220.1		+18.6	434.5951
Do.	K.	220.9		+18.3	427.3449
Near Harrisburg, S. Dak.	1484 YNKTN	228.3	227.5	+10.0	452.4681
Do.	M.	228.6		+14.7	450.8656
Do.	N.	230.2		+16.5	441.9238
Harrisburg, S. Dak.	O.	235.0		+11.3	435.7387
Near Harrisburg, S. Dak.	1419 YNKTN	235.8	235.0	+13.0	432.7091
Do.	P.	236.7		+ 9.8	422.7742
Do.	Q.	240.2		+10.7	424.4467
Near Canton, S. Dak.	R.	248.8		+12.7	408.7086
Canton, S. Dak.	S.	252.5		+ 8.8	388.3408
Do.	T.	252.6		+ 9.4	386.8119
Beloit, Iowa.	U.	255.6		+ 0.6	379.4990
Do.	B.	256.3		- 0.6	380.3322
Near Beloit, Iowa.	C.	258.8		+ 3.1	377.1390
Near Elm Springs, Iowa.	D.	260.8		+ 0.4	390.4494
Fairview, S. Dak.	U.	266.7		-11.9	370.3458
Near Fairview, S. Dak.	V.	267.5		-14.2	368.5674
Do.	W.	268.3		-13.6	369.5850
Do.	X.	269.3		-13.6	367.5695
Near Austin, Iowa.	E.	274.3		-16.6	366.1273
Hudson, S. Dak.	Y.	277.5		-18.0	373.0150
Do.	Z.	277.8		-20.4	372.5993
Near Hudson, S. Dak.	A.	270.2		-20.4	369.8590
Do.	B.	283.2		-23.1	365.7916
Near Hawarden, Iowa.	F.	287.2		-21.9	360.7244
Do.	G.	290.7		-26.9	359.1674
Calliope, Iowa.	H.	292.0		-29.9	360.4103
Hawarden, Iowa.	I.	293.7		-30.2	360.1315
Do.	City	293.8		-29.2	359.1244
Near Hawarden, Iowa.	J.	294.9		-29.2	357.7003
Do.	K.	297.3		-30.8	357.2710
Do.	L.	299.0		-30.6	355.4710
Chatsworth, Iowa.	M.	302.6		-34.1	352.4350
Do.	N.	303.6		-35.7	353.7853
Do.	O.	303.7		-35.4	354.3705
Near Chatsworth, Iowa.	P.	306.0		-35.9	352.1129
Near Akron, Iowa.	Q.	313.0		-36.6	347.3250
Akron, Iowa.	R.	314.4		-37.5	349.6556
Do.	City	314.4		-37.5	349.3054
Near Akron, Iowa.	S.	316.1		-34.2	346.6236
Do.	T.	318.8		-31.9	346.1656
Near Westfield, Iowa.	U.	322.5		-36.9	344.4646
Do.	V.	323.5		-40.6	344.6676
Do.	W.	325.0		-39.5	342.2320
Do.	X.	328.6		-40.0	343.8434
Do.	Y.	327.5		-37.9	340.5344
Do.	Z.	328.5		-37.3	341.0578
Near Elk Point, S. Dak.	C.	333.0		-36.7	342.0973
Elk Point, S. Dak.	P. B. M. <sup>233</sup>	335.1	334.0	-35.3	342.5893
Near Elk Point, S. Dak.	D.	334.9		-33.8	343.4557
Do.	E.	337.2		-37.1	342.2015
Do.	F.	341.6		-44.6	340.3462
Do.	G.	346.3		-46.4	339.4658
Jefferson, S. Dak.	P. B. M. <sup>234</sup>	346.7		-45.5	338.3428
Do.	H.	347.1		-46.2	340.2402
Do.	I.	347.7		-45.1	339.9380

\* From U, at Watertown, S. Dak.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

*Results of leveling, Watertown, S. Dak., to Sioux City, Iowa, 1905—Continued.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Jefferson, S. Dak.	J <sub>1</sub>	349.0		-47.6	339.6042
Do	K <sub>1</sub>	351.0		-48.1	338.6880
McCook, S. Dak.	L <sub>1</sub>	354.3		-45.9	337.7964
Do	P. B. M. 397	355.0		-42.6	337.0906
Near McCook, S. Dak.	M <sub>1</sub>	355.9		-44.3	337.7538
Do	N <sub>1</sub>	358.1		-47.8	336.3788
Near Sioux City, Iowa.	P. B. M. 399	358.4		-47.3	335.0462
Do	P. B. M. 398	358.5		-47.4	336.4017
Do	P. B. M. 397	361.9		-49.9	335.6345
Do	Top of cap over same	361.9		-49.9	336.8582

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.	Distance.	B-F.	B-F per kilometer.
km.	mm.	mm.	km.	mm.	mm.
24.9	-6.3	-0.25	129.0	-15.4	-0.12
46.6	+7.6	+ .16	210.5	+23.5	+ .11
84.3	-14.6	- .17	At end 361.9	-49.9	- .14

The following elevations for the top of the rail in front of each of the railroad stations named, unless otherwise stated, were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad station, Watertown, S. Dak., to Sioux City, Iowa.*

	Meters.		Meters.
Watertown, S. Dak.	525.15	Dell Rapids, S. Dak.	454.31
Grover, S. Dak.	531.42	Crossing Big Sioux River, S. Dak.	456.06
Hazel, S. Dak.	537.65	Baltic, S. Dak.	448.60
Railroad crossing, ‡ Vienna, S. Dak.	558.06	Renner, S. Dak.	438.67
Vienna, S. Dak., Chicago, Milwaukee and		Sioux Falls, S. Dak.	425.16
St. Paul station	558.22	Harrisburg, S. Dak.	435.58
Bryant, S. Dak.	562.40	T. 99 N., R. 49 W.:	
Erwin, S. Dak.	567.50	Section line between 7 and 18**	426.22
Lake Preston, S. Dak.	525.20	Section line between 18 and 17**	425.26
Railroad Crossing, S. Dak. §	525.95	Section line between 29 and 28**	431.96
Oldham, S. Dak.	524.88	Section line between 33 and 34**	420.89
Ramona, S. Dak.	549.32	R. 49 W., line between townships 99 and	
Madison, S. Dak.	509.22	98**	420.30
Wentworth, S. Dak.	516.96	T. 98 N., R. 49 W.:	
Colman, S. Dak.	517.56	Section line between 2 and 11**	409.81
Trent, S. Dak.	458.11	Section line between 14 and 23**	387.67

\* From U, at Watertown, S. Dak.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

‡ Crossing of Great Northern and Chicago, Milwaukee and St. Paul railways.

§ At crossing of Chicago and Northwestern and Chicago, Milwaukee and St. Paul railways; north-west frog.

|| 9.45 meters above water.

\*\* On rail at point where railroad crosses line.



*Elevation of top of rail in front of railroad station, Watertown, S. Dak., to Sioux City, Iowa—Continued.*

	Meters.		Meters.
Canton, S. Dak.....	380.19	Chatsworth, Iowa.....	354.19
Beloit, Iowa.....	380.61	Akron, Iowa.....	349.04
Fairview, S. Dak.....	370.58	Westfield, Iowa.....	344.94
Hudson, S. Dak.....	372.34	Elk Point, S. Dak.....	344.00
Calliope, Iowa.....	360.33	Jefferson, S. Dak.....	340.77
Hawarden, Iowa.....	359.33	McCook, S. Dak.....	338.71

#### BALTIMORE, MD.

This line was run by F. H. Sewall, Aid, from April 14 to April 17, 1905. The purpose was to connect the leveling of the Baltimore and Ohio Railroad from Washington to Baltimore with sea level at Fort McHenry, Baltimore. Satisfactory connection was made with two bench marks of the Baltimore and Ohio Railroad line and with the 10-foot mark of the gauge at Fort McHenry. The line followed the track of a branch of the Baltimore and Ohio Railroad. Connection was made with the city leveling of Baltimore through City B. M. 1181 and checked by the connection of the Baltimore and Ohio Railroad leveling on City bench marks 1288 and 1240.

Level No. 7 was used and rods V and W. The lengths of these rods at 0° C., as determined by the Bureau of Standards, were:

Date.	Rod V.	Rod W.
January, 1905.....	m. 3.0011	m. 3.0016
December, 1905.....	3.0014	3.0021

For the computation of this line the January determination, 3.00135 meters, or an excess of 0.45 millimeter per meter, was adopted. For the measurements of the rods in the field and the reason for the adoption of the above values, see the line Chicago Junction-Deshler, following.

The index correction for both rods was -0.4 millimeter.

#### *Determination of mean sea level.*

The results of the tide observations at Baltimore are as follows:

Date.	Mean sea level on tide staff.		Residuals.
	feet.	m.	m.m.
July 1, 1902, to June 30, 1903.....	4.2686	1.3011	-56.1
July 1, 1903, to June 30, 1904.....	4.0290	1.2280	+17.0
July 1, 1904, to June 30, 1905.....	3.9615	1.2075	+37.5
July 1, 1905, to June 30, 1906.....	4.0792	1.2433	+ 1.7

The mean is 4.0846 feet = 1.2450 meters  $\pm$  13.5 millimeters.

The elevations in the following tabulation depend on this determination for mean sea level.

*Results of leveling in Baltimore, Md., 1905.*

Permanent bench mark.	Dis- tance to bench mark.	Dis- tance to base of spur.	Total dis- crep- ancy (B-F) at bench mark.	Observed elevation.	Permanent bench mark.	Dis- tance to bench mark.	Dis- tance to base of spur.	Total dis- crep- ancy (B-F) at bench mark.	Observed elevation.
	km.	km.	mm.	m.		km.	km.	mm.	m.
Gauge—10 feet.....	0.0		0.0	1.8030	L.....	3.1		-3.4	21.3121
Tidal 2.....	0.1		+0.3	1.4098	M.....	5.1		-5.0	2.7411
Tidal 1.....	0.2		+1.2	1.3540	B. & O. 40.....	5.9	5.1	-7.2	7.6634
Tidal 3.....	0.3		+2.2	2.7733	B. & O. 38.....	7.1		-1.8	6.5934
Tidal 4.....	0.5		-0.1	8.3933	B. & O. 37.....	7.6		-0.7	11.2064
City 1181.....	1.7		-2.3	9.3335					

## CHICAGO JUNCTION TO DESHLER, OHIO.

This line was run by E. H. Pagenhart, Aid, between April 25 and June 7, 1905, and rerun between October 31 and November 25, 1905; part of the leveling during the first month of the spring season was done by F. H. Sewall, Aid.

Connection was made at Chicago Junction with five bench marks established by the Baltimore and Ohio Railroad. The leveling then followed that railroad, except where it was necessary to follow the highway in order to connect with Geological Survey bench marks, to Deshler, Ohio, where connection was made with two bench marks established by the Coast and Geodetic Survey in 1899 on the line Gibraltar to Cincinnati. Connection was also made with ten bench marks of the United States Geological Survey primary work along this line.

For the initial bench mark, B. & O. 507, the elevation 277.3303 meters, determined by the Baltimore and Ohio Railroad, was adopted. The elevation of I<sub>1</sub> at Deshler, upon this basis, was found to be 215.8402 meters, differing 1.5252 meters from the elevation determined by the adjustment of 1903.\* This discrepancy was shown by the field computation. Mr. Pagenhart then sent his computation to the office and proceeded to Minnesota. The office revision of the leveling showed no error in the field computation. Two profiles of the railroad track were made, one from the height of the instrument at each instrument station and one from the elevation of the foot of the rod, the instrument usually being placed on the railroad track and the rod usually being held on the railroad rail. It is believed that this test will serve to detect any blunder as large as 1 meter. No such blunder was shown.

Mr. Pagenhart was then directed, upon completing his line in Minnesota, to rerun the Chicago Junction-Deshler line in order to make certain whether the discrepancy was due to any mistake in this line. From a study of the leveling and all the available checks it appeared that there was more possibility of a mistake on certain portions of the line than on others. Over these portions, therefore, a regular double line, in strict accordance with the general instructions, was run. No mistake was found. The remaining portions were then rerun by a single line, part being run in the forward and part in the backward direction. Between the points where the previous line had left the railroad and followed highways to connect with certain

\* See Appendix 3, Report for 1903, p. 532.

United States Geological Survey bench marks, two lines were run, one over the railroad and one over the highway.

Precise level No. 7, one of the present type, and rods V and W were used on both runnings. The lengths of these rods, at 0° C., as determined by the Bureau of Standards, were:

Date.	Rod V.	Rod W.
January, 1905.....	m. 3.0011	m. 3.0016
December, 1905.....	3.0014	3.0021

These measures indicate that the rods increased in length during the season. The rods were measured in the field with a steel tape in accordance with paragraph 21 of the general instructions. The results of these measurements for the whole season are shown in the following table:

*Field measurements of rods.*  
[Reduced to 0° Centigrade.]

Date.	Rod V.	Rod W.	Date.	Rod V.	Rod W.
At Baltimore, Md.:	m.	m.	On Evansville-Stephen line- Continued.	m.	m.
April 14.....	3.0009	3.0015	April 5.....	3.0013	3.0021
On Chicago Junction-Deshler line:			April 14.....	3.0016	3.0022
April 25.....	3.0013	3.0019	April 21.....	3.0016	3.0021
May 17.....	3.0014	3.0020	Sept. 5.....	3.0015	3.0022
May 29.....	3.0012	3.0016	Sept. 16.....	3.0016	3.0023
Mean.....	3.0013	3.0018	Mean.....	3.0015	3.0021
On Evansville-Stephen line:			On Chicago Junction-Deshler line:		
June 21.....	3.0015	3.0020	Oct. 31.....	3.0017	3.0026
June 30.....	3.0013	3.0021	Nov. 10.....	3.0014	3.0022
July 14.....	3.0014	3.0020	Nov. 27.....	3.0013	3.0021
July 26.....	3.0015	3.0023	Mean.....	3.0015	3.0023

From these measures it appears that the change found by the Bureau of Standards is confirmed and seems to have taken place some time after the end of the first running of the Chicago Junction-Deshler line and before the beginning of the second running. It was decided to use the January determination for the Baltimore work, done in April, 1905, and for the first running of the Chicago Junction-Deshler line; to use the December determination for the second running of the Chicago Junction-Deshler line, and to use a mean of the two for the Evansville-Stephen line. Hence the various adopted values are: For Baltimore line, 3.00135 meters, or an excess of 0.45 millimeter per meter; for Chicago Junction-Deshler, 3.00135 meters, or an excess of 0.45 millimeter per meter; for Evansville-Stephen, 3.00155 meters, or an excess of 0.52 millimeter per meter; and for Chicago Junction-Deshler, rerunning, 3.00175 meters, or an excess of 0.58 millimeter per meter. The index correction for both rods on all lines was -0.4 millimeter, determined on December 12, 1904.

The tabulation of the spring line is given in the usual form, followed by a table showing the results from both spring and fall lines and the adopted observed elevations, the resulting elevations from the two lines being combined with the weight of two for the spring line and one for the fall line.

*Results of leveling, Chicago Junction to Deshler, Ohio, 1905.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Boughtonville.....	B. & O. 503.....	-7.0		+ 1.0	280.1974
Near Chicago Junction.....	B. & O. 504.....	-4.9		+ 5.6	283.6368
Do.....	B. & O. 505.....	-3.0		+ 0.3	284.4022
Do.....	B. & O. 506.....	-1.2		0.0	281.4092
Chicago Junction.....	B. & O. 507.....	0.0		0.0	277.3303
Do.....	Fs.....	0.3		+ 1.6	278.3508
Do.....	Gs.....	0.9		+ 2.9	281.8644
Do.....	Is.....	1.0		+ 3.2	280.7060
Near Chicago Junction.....	Js.....	4.5		- 4.3	276.6602
Do.....	Ks.....	5.8		- 2.8	276.1557
Do.....	Ls.....	8.8		- 5.4	279.5819
Siam.....	Ms.....	14.2		+ 1.7	280.0265
Do.....	Ns.....	14.6		+ 2.1	289.6996
Near Siam.....	Os.....	18.0		+ 1.1	289.4943
Scipio.....	Ps.....	22.7		+ 6.6	281.5741
Near Republic.....	859 Republic.....	26.5		+ 6.6	260.7312
Do.....	883 Col.....	27.3		+ 2.8	267.9631
Do.....	Fs.....	28.7		0.0	264.3667
Near Seneca.....	Qs.....	33.9		- 1.6	249.1986
Near Tiffin.....	Rs.....	36.7		+ 1.3	239.4741
Do.....	Ss.....	40.0		+ 2.4	230.8971
Tiffin.....	757 Col.....	41.4		+ 1.7	229.6103
Do.....	775 Tiffin.....	42.1		+ 3.0	234.8081
Do.....	Ts.....	43.1		+ 0.2	224.5979
Near Tiffin.....	Us.....	46.5		- 4.2	230.5067
Near Bascom.....	Vs.....	49.6		- 5.6	231.5807
Do.....	Ws.....	51.0		- 3.1	235.6979
Bascom.....	776 Bascom.....	52.6		- 1.4	235.1755
Do.....	766 Tol.....	52.9		- 2.8	232.3619
Near Bascom.....	Xs.....	56.7		- 0.2	232.6854
Near Fostoria.....	Ys.....	59.6		- 3.4	232.4820
Do.....	Zs.....	61.2		+ 0.2	232.6503
Fostoria.....	778 Fostoria.....	64.8		+ 6.7	236.1801
Do.....	As.....	65.9		+ 3.2	236.5501
Do.....	Bs.....	66.4		+ 0.8	237.1002
Near Fostoria.....	Cs.....	70.3		- 7.6	234.2712
Near Godsend.....	Ds.....	75.1		- 2.9	228.4383
Near Bloomdale.....	740 Tol.....	76.3		- 6.0	224.2237
Do.....	Es.....	77.6		- 2.0	224.9401
Do.....	749 Bloomdale.....	78.7		- 0.2	227.0121
Bloomdale.....	Fs.....	79.1		+ 2.1	227.7637
Near Bloomdale.....	Gs.....	80.9		- 1.7	225.5386
Bairdstown.....	Is.....	83.9		- 7.7	223.8939
Galatea.....	Js.....	87.0		-15.2	220.2087
North Baltimore.....	Ks.....	90.0		-13.2	222.2101
Near North Baltimore.....	726 Tol.....	91.0		-12.2	219.9631
Do.....	Ls.....	90.9		-16.5	220.2419
Do.....	Ms.....	92.6		-15.9	217.1214
Do.....	Ns.....	94.2		-20.9	216.4294
Near Hoytville.....	Os.....	97.5		-20.3	214.1494
Do.....	Ps.....	100.7		-22.4	214.6688
Near Deshler.....	Is.....	107.4		-17.7	215.3618
Deshler.....	Il.....	109.0		-19.5	215.8402
Do.....	Hi.....	109.3		-19.1	216.0158

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B - F.	B - F per kilometer.	Distance.	B - F.	B - F per kilometer.
km.	mm.	mm.	km.	mm.	mm.
7.2	7.0	.97	48.2	7.7	.16
23.7	+8.6	+ .36	64.8	+ 6.7	+ .10
30.2	-3.2	.11	100.7	-22.4	-.22
42.1	+3.0	+.07	At end 109.3	-19.1	-.17

\*From B. &amp; O. 507 at Chicago Junction.

†These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

The following elevations for the top of the rail in front of each of the railroad stations named were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. These elevations are based on the 1907 adopted elevation for  $I_1$  at Deshler, namely, 217.3654 meters, and are not on the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad stations, Chicago Junction to Deshler, Ohio.*

	Meters.		Meters.
Chicago Junction.....	279.06	Godsend.....	230.47
Siam.....	290.62	Bloomdale.....	228.63
Republic.....	268.62	Bairdstown.....	225.61
Seneca.....	252.97	Galatea.....	222.76
Tiffin.....	229.06	North Baltimore.....	223.48
Bascom.....	236.19	Hoytville.....	218.69
Fostoria.....	237.47	Deshler.....	217.53

In the following table are shown the results from the spring and fall lines. The distances are taken from the spring line. In the sixth column is given the number of runnings in the fall line connecting each bench mark with preceding ones. The last column gives the mean elevation from the two lines combined with the weights 2 to 1. All elevations are based on 277.3303 meters for bench mark B. & O. 507.

*Combined results of two runnings of line, Chicago Junction to Deshler, Ohio.*

Place.	Bench mark.	Distance from B. & O. 507.	Elevation.		No. of runnings in fall line.	Difference fall line—spring line.	Mean elevation $\frac{1}{2}$ spring + $\frac{1}{2}$ fall.*
			Spring line.	Fall line.			
		km.	m.	m.		mm.	m.
Near Boughtonville.....	B. & O. 503.....	-7.0	289.1974	.....	.....	.....	289.1974
Near Chicago Junction.....	B. & O. 504.....	-4.9	283.6368	.....	.....	.....	283.6368
Do.....	B. & O. 505.....	-3.1	284.4022	.....	.....	.....	284.4022
Do.....	B. & O. 506.....	-1.2	281.4092	.....	.....	.....	281.4092
Chicago Junction.....	B. & O. 507.....	0.0	277.3303	277.3303	.....	+ 0.0	277.3303
Do.....	F <sub>8</sub> .....	0.3	278.3508	278.3515	2	+ 0.7	278.3510
Do.....	G <sub>8</sub> .....	0.9	281.8644	281.8620	3	- 2.4	281.8636
Do.....	H <sub>8</sub> .....	1.0	280.7060	280.7058	2	- 0.5	280.7058
Near Chicago Junction.....	J <sub>8</sub> .....	4.5	276.6602	276.6607	4	+ 0.5	276.6604
Do.....	J <sub>9</sub> .....	5.8	276.1557	276.1558	2	+ 0.1	276.1557
Do.....	K <sub>8</sub> .....	8.8	279.5819	279.5896	2	+ 7.7	279.5845
Siam.....	L <sub>8</sub> .....	14.2	289.0265	289.0379	2	+ 11.4	289.0303
Do.....	M <sub>8</sub> .....	14.6	289.6996	289.7099	2	+ 10.3	289.7030
Near Siam.....	N <sub>8</sub> .....	18.0	289.4943	289.5062	2	+ 11.9	289.4983
Scipio.....	O <sub>8</sub> .....	22.7	281.5741	281.5867	2	+ 12.6	281.5783
Near Republic.....	859 Republic.....	26.5	260.7312	260.7486	5	+ 17.4	260.7370
Do.....	883 Col.....	27.3	267.9831	268.0010	2	+ 17.9	267.9891
Do.....	P <sub>8</sub> .....	28.7	264.3667	264.3831	6	+ 16.4	264.3722
Seneca.....	Q <sub>8</sub> .....	33.9	249.1986	249.2169	1	+ 18.3	249.2047
Near Tiffin.....	R <sub>8</sub> .....	36.7	239.4741	239.4915	1	+ 17.4	239.4799
Do.....	S <sub>8</sub> .....	40.0	230.8971	230.9102	1	+ 13.1	230.9015
Tiffin.....	757 Col.....	41.4	229.6103	229.6200	1	+ 9.7	229.6135
Do.....	775 Tiffin.....	42.1	234.8081	234.8188	1	+ 10.7	234.8117
Do.....	T <sub>8</sub> .....	43.1	224.5979	224.6107	1	+ 12.8	224.6022
Near Tiffin.....	U <sub>8</sub> .....	46.5	230.5067	230.5260	1	+ 19.3	230.5131
Near Bascom.....	V <sub>8</sub> .....	49.6	231.5907	231.6208	1	+ 30.1	231.6007
Do.....	W <sub>8</sub> .....	51.0	235.6979	235.7315	1	+ 33.6	235.7091
Bascom.....	776 Bascom.....	52.6	235.1755	235.2094	1	+ 33.9	235.1868
Do.....	796 Tol.....	52.9	232.3619	232.4040	3	+ 42.1	232.3759
Near Bascom.....	X <sub>8</sub> .....	56.7	232.6854	232.7312	3	+ 45.8	232.7007
Near Fostoria.....	Y <sub>8</sub> .....	59.5	232.4820	232.5274	3	+ 45.4	232.4971
Do.....	Z <sub>8</sub> .....	61.2	232.6503	232.7017	3	+ 51.4	232.6674

\* These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

*Combined results of two runnings of line, Chicago Junction to Deshler, Ohio—Continued.*

Place.	Bench mark.	Distance from B. & O. 507.	Elevation.		No. of runnings in fall line.	Difference fall line-spring line.	Mean elevation $\frac{1}{2}$ spring + $\frac{1}{2}$ fall.*
			Spring line.	Fall line.			
		km.	m.	m.		mm.	m.
Fostoria.....	778 Fostoria.....	64.8	236.1801	236.2419	1	+61.8	236.2007
Do.....	As.....	65.9	236.5501	236.6158	2	+65.7	236.5720
Do.....	Bs.....	66.4	237.1002	237.1662	2	+66.0	237.1222
Near Fostoria.....	Cs.....	70.3	234.2712	234.3271	2	+55.9	234.2998
Near Godsend.....	Ds.....	75.1	228.4383	228.4995	1	+61.2	228.4587
Near Bloomdale.....	740 Tol.....	76.3	224.2237	224.2843	1	+60.6	224.2439
Do.....	Es.....	77.6	224.9401	224.9995	1	+59.4	224.9599
Bloomdale.....	749 Bloomdale.....	78.7	227.0121	227.0706	1	+58.5	227.0316
Do.....	Fs.....	79.1	227.7637	227.8234	1	+59.7	227.7836
Bairdstown.....	Has.....	83.9	223.8939	223.9631	1	+69.2	223.9170
Galatosa.....	Is.....	87.0	220.2087	220.2737	1	+65.0	220.2304
North Baltimore.....	Js.....	90.0	222.2101	222.2695	2	+59.4	222.2299
Near North Baltimore.....	726 Tol.....	91.0	219.9631	220.0173	1	+54.2	219.9812
Do.....	Ks.....	90.9	220.2419	220.3005	1	+58.6	220.2614
Do.....	Ls.....	92.6	217.1214	217.1786	1	+57.2	217.1405
Do.....	Ms.....	94.2	216.4294	216.4882	1	+58.8	216.4490
Near Hoytville.....	Ns.....	97.5	214.1494	214.2135	1	+64.1	214.1708
Do.....	Os.....	100.7	214.6688	214.7405	1	+71.7	214.6927
Near Deshler.....	Ps.....	107.4	215.3618	215.4393	1	+77.5	215.3876
Deshler.....	I <sub>1</sub> .....	109.0	215.8402	215.9186	1	+78.4	215.8663
Near Deshler.....	H <sub>1</sub> .....	109.3	216.0158	216.0930	1	+77.2	216.0544
Belmore.....	J <sub>1</sub> .....	109.4	223.0959	223.0959	1	.....	223.0959

Taking  $\pm 0.8$  millimeter as the probable error of 1 kilometer of double line (see page 15) the probable error of 1 kilometer of single line is  $\pm 0.8\sqrt{2} = \pm 1.1$  millimeters, and the probable error of the difference between the two determinations of  $I_1$  at Deshler is  $\pm 13$  millimeters. The difference found was 78.4 millimeters, which is more than five times the probable error and indicates the presence of some small systematic error in the leveling.

The systematic error is, however, much too small to be of any importance in connection with the discrepancy of 1.5252 meters found at Deshler.

#### EVANSVILLE TO STEPHEN, MINN.

This line was run by E. H. Pagenhart, Aid, between June 17 and September 16, 1905, over the Great Northern Railway. No velocipede cars were used. Connection was made with the following triangulation stations: Dalton, Dalton Astronomic Station, Indian, Barnesville, Borup, Wicklow, Andover, Sherack, Argyle, and Stephen West Base.

Precise level No. 7 and rods V and W were used. The adopted mean length of these rods was 3.00155 meters, or an excess of 0.52 millimeter per meter. For the measurements of the rods by the Bureau of Standards and in the field and the reasons for adopting the above value, see page 30. The index correction of both rods was  $-0.4$  millimeter.

The elevations in the following table depend on an elevation for  $T_1$  at Evansville of 414.5425 meters, as determined on the line from St. Cloud to Watertown, which in turn depended on the 1903 adjusted elevations at St. Cloud.

The new differences of elevation between bench marks  $T_1$ ,  $S_1$ , and  $Q_1$  agreed with the differences obtained in 1904 within the limit of accuracy of the leveling. But the new leveling showed that bench mark  $R_1$  had moved since 1904. The difference

\* These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

of elevation  $S_1 - R_1$  in 1904 was  $-8.4895$  meters; in 1905,  $-8.5144$  meters, a difference of 24.9 millimeters on a distance of 8.4 kilometers. The difference of elevation,  $Q_1 - R_1$  in 1904 was  $+9.2565$  meters; in 1905,  $+9.2410$  meters, a difference of 15.5 millimeters on 2.5 kilometers. The elevation of  $R_1$  from the 1905 line is, therefore, adopted.

*Results of leveling, Evansville to Stephen, Minn., 1905.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Evansville.....	$T_1$ .....	0.0		0.0	414.5425
Do.....	$S_1$ .....	-0.1		+0.7	414.5813
Brandon.....	$R_1$ .....	-8.5		-3.7	423.0957
Near Brandon.....	$Q_1$ .....	-11.0		+2.1	432.3367
Near Evansville.....	$M_1$ .....	3.6		+4.8	417.3669
Melby.....	$N_1$ .....	7.8		-1.8	388.5899
Near Melby.....	$D_1$ .....	10.5		-6.0	372.9337
Ashby.....	$P_1$ .....	14.8		-4.4	384.8160
Do.....	$Q_2$ .....	15.0		-4.2	386.0235
Near Ashby.....	$R_2$ .....	17.4		-7.6	384.1834
Dalton.....	$S_2$ .....	27.6		-12.1	421.2520
Do.....	Dalton Astronomic Station.....	27.9		-11.7	419.9427
Do.....	$T_2$ .....	28.0		-12.7	416.4354
Near Dalton.....	Dalton Triangulation Station.....	29.7	28.0	-8.0	423.2069
Do.....	$U_1$ .....	32.5		-13.4	378.9199
Parkdale.....	$V_1$ .....	37.7		-15.5	376.8662
Near Fergus Falls.....	$W_1$ .....	41.5		-15.2	367.4364
Fergus Falls.....	$X_1$ .....	46.0		-7.2	364.3364
Do.....	$Y_1$ .....	46.3		-6.4	364.4300
Do.....	City.....	46.7		-4.2	362.8139
Do.....	$Z_1$ .....	47.0		-2.8	363.4658
Near Fergus Falls.....	$A_1$ .....	54.1		-4.2	366.6643
Do.....	$B_1$ .....	55.2		-5.6	360.2590
Carlisle.....	$C_1$ .....	60.5		+2.7	373.3812
Near Carlisle.....	$D_2$ .....	65.2		+1.7	373.4684
Near Rothsay.....	$E_1$ .....	73.5	69.9	+4.8	421.8911
Rothsay.....	$F_1$ .....	74.1		+0.4	364.2986
Do.....	$G_1$ .....	74.3		+1.4	366.1494
Do.....	$H_1$ .....	74.6		+3.0	368.8966
Near Rothsay.....	$I_1$ .....	79.9		+3.4	344.1521
Lawndale.....	$J_1$ .....	85.7		-10.8	326.0560
Near Lawndale.....	$K_1$ .....	88.1		-14.6	318.0024
Near Barnesville.....	$L_1$ .....	93.0		-10.6	315.2642
Do.....	$M_1$ .....	96.4		-10.2	312.6502
Barnesville.....	$N_2$ .....	97.7		-10.3	315.5112
Do.....	$O_1$ .....	98.2		-10.6	312.6048
Near Barnesville.....	$Q_3$ .....	106.0	100.0	-22.7	290.4927
Do.....	$P_2$ .....	101.4		-6.2	301.4621
Downer.....	$R_3$ .....	110.4		0.0	294.6761
Do.....	$S_3$ .....	110.7		-1.2	295.2406
Near Downer.....	$T_3$ .....	113.4		-3.1	291.0861
Near Crawford.....	$U_2$ .....	119.8		-3.8	289.8062
Near Glyndon.....	$V_2$ .....	124.8		+0.1	281.9417
Glyndon.....	$W_2$ .....	126.5		+0.6	281.6691
Near Averill.....	$X_2$ .....	135.1		-3.9	279.5989
Averill.....	$Y_2$ .....	138.1		-5.1	279.7337
Near Felton.....	$Z_2$ .....	145.6		-0.1	279.6601
Felton.....	$A_2$ .....	150.3		+0.4	278.3385
Do.....	$B_2$ .....	150.5		+0.4	278.2207
Near Borup.....	$C_2$ .....	156.9		-1.2	277.4021
Borup.....	$D_3$ .....	161.8		+1.2	277.1679
Do.....	$E_2$ .....	162.4	161.8	+3.0	277.3910
Wheatville.....	$F_3$ .....	166.6		+3.3	275.8213
Ada.....	$G_2$ .....	175.1		+9.8	276.9746
Do.....	U. S. G. S. Meridian Mark.....	175.5	175.1	+11.4	276.1005
Do.....	$H_2$ .....	175.3		+10.4	276.6145
Do.....	$I_2$ .....	175.6		+10.3	276.1201
Hadler.....	$J_2$ .....	183.2		+8.1	274.7962
Near Hadler.....	$K_2$ .....	186.0	184.0	+9.5	276.3330
Lockhart.....	$L_2$ .....	191.4		+16.6	272.3733
Beltrami.....	$M_2$ .....	202.8		+17.9	275.7637
Do.....	$N_3$ .....	202.9		+17.8	275.9663
Near Beltrami.....	$O_2$ .....	204.5		+17.8	274.8737
Russia.....	$P_3$ .....	212.7		+17.3	272.6615

\* From  $T_1$  at Evansville.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

*Results of leveling, Evansville to Stephen, Minn., 1905—Continued.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Russia.....	Q <sub>2</sub> .....	214.4		+16.3	271.4836
Kittson.....	R <sub>2</sub> .....	219.7		+17.3	269.7257
Near Kittson.....	S <sub>2</sub> .....	221.7		+17.2	268.6082
Do.....	T <sub>2</sub> .....	223.5		+18.4	268.3476
Crookston.....	U <sub>2</sub> .....	230.1		+14.9	265.2855
Do.....	V <sub>2</sub> .....	230.4		+14.3	266.6009
Do.....	City.....	230.6		+11.8	264.8478
Do.....	W <sub>2</sub> .....	231.8	231.4	+ 9.6	271.9535
Near Crookston.....	X <sub>2</sub> .....	235.5		+11.6	272.0470
Shirley.....	Y <sub>2</sub> .....	241.2		+15.2	275.5507
Near Shirley.....	Z <sub>2</sub> .....	242.9		+19.4	275.6228
Near Euclid.....	A <sub>2</sub> .....	252.2		+23.0	274.2156
Euclid.....	B <sub>2</sub> .....	253.1		+25.8	271.9786
Near Euclid.....	C <sub>2</sub> .....	256.4		+27.3	270.8264
Near Angus.....	D <sub>2</sub> .....	264.7	257.9	+42.5	262.4142
Angus.....	E <sub>2</sub> .....	266.1		+27.8	266.0258
Near Angus.....	F <sub>2</sub> .....	270.3		+26.0	265.2673
Warren.....	G <sub>2</sub> .....	279.8		+30.9	260.6412
Do.....	H <sub>2</sub> .....	280.4		+33.8	261.6230
Do.....	I <sub>2</sub> .....	280.8		+32.1	261.4590
Do.....	J <sub>2</sub> .....	281.3		+31.7	261.7153
Near Warren.....	K <sub>2</sub> .....	284.9		+34.0	260.4375
Near Argyle.....	L <sub>2</sub> .....	294.0		+29.5	258.5716
Argyle.....	M <sub>2</sub> .....	297.1		+25.9	258.1580
Do.....	N <sub>2</sub> .....	297.6		+26.4	259.4938
Near Argyle.....	O <sub>2</sub> .....	302.9	301.4	+20.2	260.2225
Near Stephen.....	P <sub>2</sub> .....	309.2		+20.6	255.5101
Stephen.....	Q <sub>2</sub> .....	311.4		+23.7	253.6448
Do.....	R <sub>2</sub> .....	311.8		+23.1	253.7318
Do.....	S <sub>2</sub> .....	312.5		+25.7	253.0357
Near Stephen.....	T <sub>2</sub> .....	314.4		+23.2	253.8041
Do.....	Stephen West Base.....	314.4		+22.2	253.4928

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.	Distance.	B-F.	B-F per kilometer.
km.	mm.	mm.	km.	mm.	mm.
34.1	-18.4	-0.54	177.3	+13.6	+0.08
63.7	+ 5.9	+ .09	209.1	+19.1	+ .09
69.9	- 4.0	- .06	284.9	+34.0	+ .12
76.4	+ 8.1	+ .11	At end 314.4	+22.2	+ .07
88.1	-14.6	- .17			

The following elevations for the top of the rail in front of each of the railroad stations named, unless otherwise stated, were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad stations, Evansville to Stephen, Minn.*

	Meters.		Meters.
Evansville, in front of block signal.....	412.85	Carlisle, in front of block signal.....	369.24
Ashby.....	388.71	Rothsay, opposite block signal.....	363.98
Dalton, in front of block signal.....	412.48	Lawndale, in front of signboard.....	326.54
Parkdale.....	375.23	Barnesville, opposite middle of platform..	313.12
Fergus Falls, in front of block signal.....	365.02	Downer, in front of block signal.....	295.34

\* From T<sub>1</sub>, at Evansville.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.



*Elevation of top of rail in front of railroad stations, Evansville to Stephen, Minn.—Continued.*

	Meters.		Meters.
Crawford, in front of signboard.....	284.94	Russia, in front of signboard.....	273.41
Glyndon, 10 meters north of railroad cross- ing.....	282.11	Kittson, in front of signal.....	270.43
Averill, in front of station before track was raised.....	280.22	Crookston, in front of block signal.....	265.73
Felton, in front of signal.....	279.24	Shirley, opposite signboard.....	276.18
Borup, in front of signal.....	277.87	Euclid, at Northern Pacific Railway cross- ing.....	275.66
Wheatville, in front of mail rack.....	276.46	Euclid, in front of signal.....	273.31
Ada, in front of signal.....	276.47	Angus, in front of signal before track was raised.....	266.62
Hadler, in front of signboard.....	275.42	Warren, in front of block signal.....	261.54
Lockhart, in front of signboard.....	273.34	Argyle, in front of signal.....	259.17
Beltrami, in front of block signal.....	276.36	Stephen, in front of block signal.....	253.50

## SMITHVILLE TO GALVESTON, TEX.

This line was run by E. H. Pagenhart, Aid, between December 9, 1905, and February 10, 1906. The leveling started from three bench marks at Smithville, Tex., on the line Holland to New Braunfels (see Appendix 7, Report for 1904), and followed the Missouri, Kansas and Texas Railway to Galveston, where it was connected with sea level.

Precise level No. 7 and rods R<sub>1</sub> and S were used. The lengths of these rods at 0° C., as determined by the Bureau of Standards, were:

Date.	Rod R <sub>1</sub> .	Rod S.
January, 1905.....	m. 3.0009	m. 3.0014

No measurement was made after the leveling. The rods were measured in the field, in accordance with paragraph 21 of the general instructions, and no change in length was shown by such measurements for the period of leveling. The mean value for the two rods used in the computation was 3.00115 meters, or an excess of 0.38 millimeter per meter. The index correction of rod R<sub>1</sub> was -0.6 millimeter; of rod S -0.9 millimeter, determined in October, 1905.

*Determination of mean sea level.*

The results of the tide observations at Galveston are as follows:

Dates.	Mean sea level on tide staff.		Resid- uals.
	feet.	m.	mm.
Dec. 1, 1903, to Nov. 30, 1904.....	4.6307	1.4114	0.0
Dec. 1, 1904, to Nov. 30, 1905.....	4.6296	1.4111	+0.3
Dec. 1, 1905, to Nov. 29, 1906.....	4.6314	1.4117	-0.3

The mean is 4.6306 feet = 1.4114 meters  $\pm$  0.2 millimeter.

The elevations in the following table are based on an elevation of 100.6165 meters for  $W_1$  at Smithville, Tex., as determined by the line Holland to New Braunfels, which in turn depended on the 1903 adjusted elevation at Fort Worth.

The new determination of the differences of elevation of the three bench marks at Smithville agreed with the previous determinations within less than 1 millimeter.

*Results of leveling, Smithville to Galveston, Tex., 1905-6.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Smithville.....	$W_1$	0.0		0.0	100.6165
Primms Spur.....	316 Primms Spur.....	7.7		- 9.8	94.6793
Near Kirtley.....	$U_1$	10.8		- 4.9	94.9758
West Point.....	292 West Point.....	13.9		- 4.1	87.3486
Do.....	$V_1$	14.6		- 2.6	90.3099
Plum.....	$W_2$	21.0		+ 6.0	91.3095
Do.....	$X_1$	21.4		+ 8.2	91.2728
Near La Grange.....	$Y_1$	27.7		+ 7.5	86.1169
La Grange.....	$Z_1$	30.9		+ 3.4	82.1828
Do.....	$A_1$	31.0		+ 3.4	82.0297
Do.....	$B_1$	31.4		+ 4.7	83.6005
Near Halsted.....	$C_1$	38.7		+11.9	99.3739
Halsted.....	$D_1$	40.6		+12.5	94.0481
Fayetteville.....	$E_1$	52.5		- 2.1	127.2390
Do.....	$F_1$	52.9		- 2.3	120.0793
Boggy-tank.....	$G_1$	59.4		- 6.0	82.6230
Near New Ulm.....	$H_1$	66.4		- 0.9	109.4219
New Ulm.....	$I_1$	72.4		- 4.4	122.5452
Do.....	$J_1$	72.8		- 3.8	119.8942
Near New Ulm.....	$K_1$	80.0		- 1.4	110.1730
Cat Springs.....	$L_1$	89.1		- 8.3	92.5654
Near Sealy.....	$M_1$	97.8		- 6.9	69.0330
Do.....	$N_1$	101.2		- 7.0	66.5895
Sealy.....	$O_1$	107.0		- 4.5	62.0314
Do.....	$P_1$	107.8		- 5.4	62.2254
Do.....	$Q_1$	107.8		- 6.1	61.0594
Near San Felipe.....	$R_1$	115.2		-13.9	45.0437
Near McDowell.....	$S_1$	119.8		-16.2	37.9390
Near Brookshire.....	$T_1$	123.2		-16.6	36.5890
Brookshire.....	$U_1$	127.6		-13.0	49.5052
Near Brookshire.....	$V_1$	133.1		-13.4	47.8855
Near Katy.....	$W_1$	138.6		-12.4	43.7942
Katy.....	$X_1$	140.8		-13.1	43.0680
Do.....	$Y_1$	141.2		-12.8	43.4128
Near Katy.....	$Z_1$	145.4		-11.9	40.9742
Burnap.....	$A_2$	148.6		-16.2	38.0261
Barker.....	$B_2$	154.3		-18.6	32.1308
Letitia.....	$C_2$	158.6		-11.0	29.3440
Near Hillendahl.....	$D_2$	165.2		-23.4	27.3845
Do.....	$E_2$	168.4		-20.7	26.5207
Do.....	$F_2$	170.9		-23.0	23.9474
Do.....	$G_2$	174.3		-20.7	21.8746
Eureka.....	$H_2$	178.6		-32.1	20.8885
Houston Heights.....	$I_2$	182.2		-36.0	18.5781
Houston.....	$J_2$	187.1		-42.4	13.6974
Do.....	$K_2$	187.5		-40.7	12.8896
Do.....	$L_2$	188.5		-43.1	13.2682
Do.....	City	191.3	190.3	-42.9	13.9466
Near Houston.....	$M_2$	193.3		-45.1	13.1889
Near Harrisburg.....	$N_2$	196.4		-47.4	7.0986
Harrisburg.....	R. M.	197.3		-44.3	11.6436
Near Harrisburg.....	$O_2$	198.7		-43.7	11.4095
Do.....	M. M. 9.	202.6		-38.5	10.7407
Do.....	$P_2$	204.1		-35.3	11.6485
Near Genoa.....	$Q_2$	205.8		-37.3	11.3201
Do.....	M. M. 12.	207.4		-40.7	12.5681
Genoa.....	$R_2$	211.0		-40.6	15.1707
Do.....	$S_2$	211.1		-38.4	14.3156
Near Genoa.....	M. M. 16.	213.9		-40.4	13.2584
Do.....	M. M. 18.	217.1		-43.7	9.4708
Near Webster.....	$T_2$	221.3		-49.2	9.5799
Webster.....	$U_2$	223.1		-45.4	8.1764
Near Webster.....	M. M. 22.	223.7		-47.2	8.1891

\* From  $W_1$  at Smithville.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

*Results of leveling, Smithville to Galveston, Tex., 1905-6—Continued.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
League City.....	V <sub>1</sub> .....	227.4		-47.0	7.1539
Near League City.....	W <sub>1</sub> .....	230.8		-43.3	6.9717
Near Dickinson.....	X <sub>1</sub> .....	233.8		-44.5	6.4697
Dickinson.....	Y <sub>1</sub> .....	234.7		-42.1	5.6548
Near Dickinson.....	Z <sub>1</sub> .....	235.6		-42.8	5.8986
Near Lamarque.....	M. M. 22.....	239.9		-39.5	6.3321
Do.....	M. M. 24.....	243.1		-36.2	5.4607
Lamarque.....	A <sub>1</sub> .....	246.6		-32.2	5.6494
Do.....	B <sub>1</sub> .....	247.3		-29.7	5.2502
Texas City Junction.....	C <sub>1</sub> .....	250.8		-30.5	2.5602
Near Texas City Junction.....	M. M. 41.....	254.5		-29.6	1.2938
Virginia Point.....	D <sub>1</sub> .....	257.1		-31.2	1.4715
Near Galveston.....	E <sub>1</sub> .....	264.6	264.1	-31.0	0.7154
Galveston.....	F <sub>1</sub> .....	265.8		-29.8	2.0022
Do.....	G <sub>1</sub> .....	267.9		-30.2	2.3498
Do.....	Tidal 19.....	268.6		-30.3	2.9137
Do.....	Tidal 18.....	268.6		-30.6	1.7067
Do.....	Tidal 17.....	270.0		-31.0	2.5497
Do.....	City.....	270.2		-31.8	3.0711
Do.....	Tidal 16.....	270.4		-31.2	1.8555
Do.....	Tidal 15.....	270.7		-32.3	1.9269
Do.....	Tidal 14.....	271.0		-32.4	1.8979
Do.....	Tidal 13.....	271.3		-31.5	2.3527
Do.....	Tidal 12.....	271.6		-32.6	2.5793
Do.....	Tidal 11.....	271.9		-33.4	2.4636
Do.....	Tidal 10.....	272.2		-33.8	2.5881
Do.....	Tidal 9.....	272.5		-34.6	0.9381
Do.....	Tidal 4.....	272.6		-35.9	2.4248
Do.....	Tidal 3.....	272.6		-35.7	2.2729
Do.....	Tidal 2.....	272.7		-35.7	1.6018
Do.....	Tidal 8.....	273.2	272.7	-33.5	2.5754
Do.....	Tidal 7.....	273.5	272.7	-33.9	2.5496
Do.....	Tidal 6.....	273.8	272.7	-33.6	2.3836
Do.....	Tidal 5.....	274.0	272.7	-34.6	1.0155

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.	Distance	B-F.	B-F per kilometer.
km.	mm.	mm.	km.	mm.	mm.
0.0	-9.8	-1.63	196.2	-48.4	-0.25
23.2	+8.9	+ .38	221.3	-49.2	- .22
44.0	+14.1	+ .32	At end 272.8	-34.8	- .13
61.3	-10.0	- .16			

The following elevations for the top of the rail in front of each of the railroad stations named, unless otherwise stated, were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad station, Smithville to Galveston, Tex.*

	Meters.		Meters.
Kirtley.....	94.85	New Ulm.....	119.48
West Point.....	91.26	Cat Springs.....	93.07
Plum.....	91.88	Sealy.....	62.01
La Grange.....	81.54	San Felipe.....	47.40
Halsted.....	97.03	McDowell.....	39.44
Fayetteville.....	120.47	Brookshire.....	49.76
Haffer.....	98.48	Dorson.....	48.52
Pisak.....	88.36	Katy.....	43.45

\* From W<sub>1</sub> at Smithville.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

*Elevation of top of rail in front of railroad station, Smithville to Galveston, Tex.—Continued.*

	Meters.		Meters.
Burnap.....	38.58	Dumont.....	11.86
Barker.....	32.89	Genoa.....	14.33
Letitia.....	29.80	Galveston, Harrisburg and San Antonio	
Hillendahl.....	26.61	Railway crossing.....	12.05
Houston and Texas Central Railroad cross- ing.....	21.25	Webster.....	8.80
Houston (Galveston, Houston and Hender- son Railroad station).....	15.76	League City.....	7.00
Houston (Missouri, Kansas and Texas Rail- way station).....	10.80	Shell Sound.....	7.70
San Antonio and Aransas Pass Railway crossing.....	15.20	Dickinson.....	6.63
		*Lamarque.....	4.72
		Texas City.....	3.21
		Virginia Point.....	2.27
		Galveston.....	1.74

## GREENWICH TO SULLIVAN, OHIO; ELLWOOD CITY TO MONACA, PA.; AND ALLIANCE TO STRUTHERS, OHIO.

These lines were run by E. H. Pagenhart, Aid, between September 19 and October 25, 1906. It has already been stated on page 29, in connection with the line from Chicago Junction to Deshler, Ohio, that a discrepancy of about  $1\frac{1}{2}$  meters was found at Deshler between the 1903 adjusted elevation at that point and the elevation carried from Pittsburg, as adjusted in 1903, through the Baltimore and Ohio Railroad leveling and the Coast and Geodetic Survey line, Chicago Junction to Deshler. A rerunning of the line from Chicago Junction to Deshler made it certain that no mistake existed in that line. The United States Geological Survey had run many lines of levels of a grade below precise leveling in Pennsylvania and Ohio, and these lines formed many circuits with the Baltimore and Ohio Railroad leveling. From a careful study of these circuits, the United States Geological Survey indicated to this Survey where it was thought probable that large mistakes had been made in the Baltimore and Ohio leveling. These three lines were run to locate any such mistakes.

Precise level No. 9 and rods T and U were used. The lengths of the rods, at 0° C., as determined by the Bureau of Standards, were:

Date.	Rod T.	Rod U.
October, 1905.....	m. 3.0020	m. 3.0015

No measurement was made after the leveling. The measurements made in the field in accordance with paragraph 21 of the general instructions were not sufficient to show whether or not the rods had changed in length. The mean, 3.00175 meters, or an excess of 0.58 millimeter per meter, was used in the computation. Past experience of the stability of the rods in length indicates that the uncertainty in this adopted length is so small that no difference of elevation between any two bench marks on any one of these lines is uncertain from this cause by as much as 20 millimeters.

The line from Greenwich to Sullivan was run over the same ground, using the same bench marks as the Baltimore and Ohio Railroad leveling, thus furnishing a means not only of definitely locating the mistake, but of obtaining data as to the accuracy of the Baltimore and Ohio Railroad leveling and the weight that should

\* Four rails north of station.

be given to this class of work in the adjustment of the level net. Sixteen bench marks of the Baltimore and Ohio Railroad were recovered and two of the United States Geological Survey. It was found that the new difference of elevation between B. & O. 492 and B. & O. 491 was 3.7335 meters, while the difference determined by the Baltimore and Ohio Railroad was 2.6884 meters, an error of 1.0451 meters, or about 3.3 feet. When the Chief Engineer of the Baltimore and Ohio Railroad was informed of the result obtained from the Coast and Geodetic Survey line he had certain check leveling done and informed this Survey, in February, 1907, that his levelman now found the difference, B. & O. 492-B. & O. 491 = + 12.4700 feet (or 3.8009 meters).

The purpose of the lines from Ellwood City to Monaca, Pa., and from Alliance to Struthers, Ohio, was to locate a mistake of about 1 meter supposed to exist in the Baltimore and Ohio Railroad line between Mahoningtown, Pa., and Girard, Ohio, to break up the long narrow circuit East Akron Junction-Canton-Monaca-Pittsburg-East Akron Junction into smaller circuits, and to test the accuracy of the Baltimore and Ohio Railroad line and the line Monaca to Canton.

The line from Ellwood City to Monaca followed the Pittsburg and Lake Erie Railroad branch track as far as West Ellwood Junction, where a section of about half a mile was run across country to the Pennsylvania tracks. Connection was made at Monaca with the levels of the Corps of Engineers, U. S. Army, along the Ohio River.

The line from Alliance to Struthers followed the Pennsylvania Railroad from Alliance to Boenna Crossing, thence the Baltimore and Ohio Railroad to Struthers. Both this line and the preceding one showed large discrepancies between the new elevations and those previously determined by the Monaca-Canton line, in some cases indicating movement of the bench marks, in others large uncertainties in the leveling.

It was found, after these lines were run, that no circuit had a larger closing error than seemed allowable from the classes of leveling composing it.

*Results of leveling, Greenwich to Sullivan, Ohio, 1906.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Greenwich.....	B. & O. 495.....	0.0	.....	0.0	315.2060
Do.....	B. & O. 494.....	1.7	.....	-0.3	316.2726
Do.....	B. & O. 493.....	3.2	.....	+0.5	312.1655
Near Rainey.....	B. & O. 492.....	5.1	.....	+2.8	303.5469
Near Hereford.....	B. & O. 491.....	6.7	.....	+7.5	299.8134
Do.....	B. & O. 490.....	8.9	.....	+7.8	307.8711
Do.....	B. & O. 489.....	10.7	.....	+3.3	314.7909
Do.....	B. & O. 488.....	12.2	.....	+6.9	318.6126
Near Nova.....	B. & O. 487.....	14.0	.....	+6.6	325.1364
Do.....	B. & O. 486.....	16.4	.....	+8.7	335.0142
Nova.....	1127 A D J.....	17.8	.....	+8.2	342.1370
Do.....	B. & O. 485A.....	18.2	.....	+7.6	337.1794
Near Nova.....	B. & O. 485.....	18.8	.....	+8.2	340.9245
Do.....	B. & O. 484.....	20.2	.....	+7.0	344.3754
Near Sullivan.....	B. & O. 483.....	22.7	.....	+9.0	341.9957
Sullivan.....	B. & O. 482.....	25.3	.....	+7.4	340.5966
Do.....	1136 Canton.....	25.6	.....	+7.8	345.2241
Near Sullivan.....	B. & O. 481.....	28.1	.....	+4.8	339.6931

\* From B. & O. 495 near Greenwich, Ohio.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance	B-F	B-F per kilometer
km.	mm.	mm.
22.1	+9.8	+ .44
At end 28.1	+4.8	+ .17

The following elevations for the top of the rail in front of each of the railroad stations named were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad stations, Greenwich to Sullivan, Ohio.*

	Meters.
Hereford.....	310.05
Nova.....	339.57
Sullivan.....	344.29

*Results of leveling, Ellwood City to Monaca, Pa., 1906.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrep- ancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Ellwood City.....	B. & O. 349.....	0.0		+ 0.0	271.5836
Ellwood City.....	B. & O. 349A.....	0.8		+ 3.8	274.7658
Near Ellwood City.....	B. & O. 350.....	2.8		+ 6.9	287.3046
Near West Ellwood Junction.....	A <sub>2</sub> .....	6.2		+ 8.7	287.9227
Homewood.....	Br. 38 (1906).....	9.9		+15.0	290.3238
Near Homewood.....	Br. 39 (1906).....	10.3	9.9	+14.5	292.1592
Summit.....	Br. 40.....	13.6	9.9	+13.3	319.6018
Mayfield.....	Br. 34.....	14.7		+12.0	261.9590
Geneva.....	Geneva Depot (1906).....	15.9		+ 8.6	252.8026
Beaver Falls.....	B. F. Depot (1906).....	17.4		+ 7.5	240.7440
Kenwood.....	Br. 29.....	18.9		+ 9.2	228.5944
New Brighton.....	New Brighton Depot.....	20.4		+ 9.9	229.5641
Near New Brighton.....	Br. 27½.....	21.4		+11.9	223.9793
Do.....	Br. 26.....	23.3		+13.3	217.3310
Monaca.....	25A.....	25.9		+13.9	229.9230

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.
km.	mm.	mm.
11.9	+15.0	+1.26
At end 25.9	+13.9	+ .54

The following elevations for the top of the rail in front of each of the railroad stations named were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of

\* From B. & O. 349 near Ellwood City, Pa.

† These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad station, Ellwood City to Monaca, Pa.*

	Meters.
Highland.....	310.34
Homewood.....	319.53

*Results of precise leveling, Alliance to Struthers, Ohio, 1906.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Alliance.....	Br. 66.....	0.0		0.0	334.2868
Alliance.....	Qa.....	0.5		+2.3	336.4066
Do.....	City.....	0.9		+4.0	337.0888
Do.....	Pa.....	1.0		+3.0	341.3526
Do.....	Lunchroom.....	1.3		+4.2	331.6839
Near Alliance.....	Br. 65 (1906).....	2.7		+2.4	321.7835
Do.....	Br. 64 (1906).....	4.2		+2.4	324.0448
Near Sebring.....	West Culvert.....	7.0	5.8	+6.3	338.4938
Do.....	East Culvert.....	7.2	5.8	+4.4	337.3378
Near Snodes.....	Se.....	10.3		+8.8	332.5874
Near Berlin Center.....	Ta.....	13.8		+5.5	332.1716
Do.....	Ua.....	16.1		+4.6	330.8848
Berlin Center.....	Ua.....	19.1		+7.7	337.3722
Ellsworth.....	Wa.....	25.0		+5.6	341.7901
Koesmont.....	Xa.....	28.0		+1.8	326.7907
Do.....	Ya.....	28.4		+5.0	329.6686
Do.....	Za.....	28.6		+5.3	324.9986
North Jackson.....	A7.....	33.4		+11.0	306.4831
Do.....	B7.....	33.8		+11.6	312.5219
Near North Jackson.....	C7.....	36.1		+13.3	305.4620
Lordstown.....	D7.....	39.4		+12.4	289.4753
Near Lordstown.....	E7.....	40.9		+12.8	280.5857
Near Boenna Crossing.....	F7.....	44.0		+12.6	274.3365
Near Niles.....	G7.....	48.2		+17.8	268.2503
Near Girard.....	H7.....	52.4		+14.1	268.3680
Near Youngstown.....	I7.....	55.7		+18.4	269.6177
Do.....	J7.....	59.5		+15.9	263.9643
Do.....	B. & O. 381.....	61.9	61.1	+12.9	256.8874
Youngstown.....	B. & O. 380.....	62.0		+13.7	257.3790
Do.....	R. R.....	62.9		+13.2	258.4188
Hazeltown.....	E37 A D J.....	65.0		+17.3	255.1673
Near Struthers.....	B. & O. 377.....	67.3		+10.4	258.4239
Struthers.....	B. & O. 376.....	69.2		+10.4	257.7018

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.	Distance.	B-F.	B-F per kilometer.
km.	mm.	mm.	km.	mm.	mm.
19.4	+10.8	+56	66.6	+18.8	+28
40.9	+12.8	+31	At end 69.2	+16.4	+24
55.7	+18.4	+33			

The following elevations for the top of the rail in front of each of the railroad stations named were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad stations, Alliance to Struthers, Ohio.*

	Meters.		Meters.
Snodes.....	341.81	Ellsworth.....	342.33
Berlin Center.....	336.62	North Jackson.....	313.31

\*From B. M. Br. 66 near Alliance, Ohio.

†These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.

## UNITED STATES ENGINEER LINES.

As in Appendix 8, Report for 1899, and Appendix 3, Report for 1903, the term "Engineer" is used as a convenient short designation for leveling done under the direction of the Corps of Engineers, U. S. Army, the Mississippi River Commission, or the Missouri River Commission, and all published in the Reports of the Chief of Engineers, U. S. Army. These organizations used the Kern level and the leveling was done under instructions published in full in the Report of the Chief of Engineers for 1899, Part 5, page 3469, or instructions which differed from these only in minor details.

## FORT ADAMS TO VICKSBURG, MISS.

This line was run under the direction of the Mississippi River Commission and the particulars in regard to it were furnished by the Chief of Engineers in the form of a copy of the manuscript for a printed report.

The field work was done by E. L. Harman and G. H. Wolbrecht in 1905-6. Kern levels and rods were used.

Connection was made at Fort Adams with five bench marks established and determined in 1900. On four of the bench marks the agreement was close, but on the fifth, P. B. M. XLVIII, the discrepancy was such that a movement of the bench mark in the interval was indicated and therefore the elevation from the 1905-6 line is adopted.

The line followed the bank of the Mississippi River to Delta, La., thence to the gauge bench marks at Kleinston, below Vicksburg, Miss. River crossings were made at frequent intervals and permanent bench marks established on each side of the river. Connection was made with all old Coast and Geodetic Survey bench marks now in existence, except a few in the vicinity of Davis Island. The connections at Vidalia and at Vicksburg, Miss., two junction points in the net, are given in the "Condensed Statement of Direct Results of Observations," in this publication.

This line supersedes entirely the old Coast and Geodetic Survey line between Fort Adams and Vicksburg.

The probable error per kilometer in the main line is stated by the Chief of Engineers to be  $\pm 0.61$  millimeter.

## BARBIN TO ACME, LA.

This line was run along a dirt road by T. C. Thomas between November 20 and December 9, 1899. The results are given in detail in the Report of the Chief of Engineers for 1902, Part II, pages 1466-1467.

Three temporary bench marks, established in 1891, were recovered at Barbin, a point of the line from Grand Bend to Smithland. The leveling indicated no change in two of the bench marks but a settling of 19.8 millimeters in the third. The line connected satisfactorily on two bench marks near the mouth of the Black River established in 1894.



levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad station, Ellwood City to Monaca, Pa.*

	Meters.
Highland.....	310.34
Homewood.....	319.53

*Results of precise leveling, Alliance to Struthers, Ohio, 1906.*

Place.	Permanent bench mark.	Distance to bench mark.*	Distance to base of spur.*	Total discrepancy (B-F) at bench mark.	Observed elevation.†
		km.	km.	mm.	m.
Near Alliance.....	Br. 66.....	0.0		0.0	334.2868
Alliance.....	Qs.....	0.5		+ 2.3	336.4096
Do.....	City.....	0.9		+ 4.0	337.0588
Do.....	Rs.....	1.0		+ 3.0	341.3526
Do.....	Lunchroom.....	1.3		+ 4.2	331.6839
Near Alliance.....	Br. 65 (1906).....	3.7		+ 2.4	321.7835
Do.....	Br. 64 (1906).....	4.2		+ 2.4	324.0448
Near Sebring.....	West Culvert.....	7.0	5.8	+ 6.3	338.4938
Do.....	East Culvert.....	7.2	5.8	+ 4.4	337.3378
Near Snodes.....	Ss.....	10.3		+ 8.8	332.5874
Near Berlin Center.....	Ts.....	13.8		+ 5.5	332.1716
Do.....	Us.....	16.1		+ 4.6	330.8848
Berlin Center.....	Vs.....	19.1		+ 7.7	337.3722
Ellsworth.....	Ws.....	25.0		+ 5.6	341.7961
Rosemont.....	Xs.....	28.0		+ 1.8	326.7967
Do.....	Ys.....	28.4		+ 5.0	329.6696
Do.....	Zs.....	28.6		+ 5.3	324.9988
North Jackson.....	A7.....	33.4		+11.0	309.4831
Do.....	B7.....	33.8		+11.6	312.5219
Near North Jackson.....	C7.....	36.1		+13.3	305.4626
Lordstown.....	D7.....	39.4		+12.4	289.4753
Near Lordstown.....	E7.....	40.9		+12.8	280.5857
Near Boenna Crossing.....	F7.....	44.0		+12.6	274.3365
Near Niles.....	G7.....	48.2		+17.8	268.2503
Near Girard.....	H7.....	52.4		+14.1	268.3680
Near Youngstown.....	I7.....	55.7		+18.4	269.6177
Do.....	J7.....	59.5		+15.9	263.9643
Do.....	B. & O. 381.....	61.9	61.1	+12.9	256.8874
Youngstown.....	B. & O. 390.....	62.0		+13.7	257.3790
Do.....	R. R.....	62.9		+13.2	258.4188
Hazeltown.....	237 A D J.....	65.0		+17.3	255.1673
Near Struthers.....	B. & O. 377.....	67.3		+16.4	258.4239
Struthers.....	B. & O. 376.....	69.2		+10.4	257.7018

*Principal maximum values of total discrepancy (B-F) in main line.*

Distance.	B-F.	B-F per kilometer.	Distance.	B-F.	B-F per kilometer.
km.	mm.	mm.	km.	mm.	mm.
19.4	+10.8	+ .56	66.6	+18.8	+ .28
40.9	+12.8	+ .31	At end 69.2	+16.4	+ .24
55.7	+18.4	+ .33			

The following elevations for the top of the rail in front of each of the railroad stations named were determined during the progress of the leveling, usually by a single rod reading taken from one of the instrument stations on the main line of levels. They are computed upon the same basis as the elevations in the preceding tables.

*Elevation of top of rail in front of railroad stations, Alliance to Struthers, Ohio.*

	Meters.		Meters.
Snodes.....	341.81	Ellsworth.....	342.33
Berlin Center.....	336.62	North Jackson.....	313.31

\*From B. M. Br. 66 near Alliance, Ohio.

†These observed elevations are superseded by the 1907 adopted elevations, given later in this publication, which depend on an adjustment.



## ARCHIBALD TO COLUMBIA, LA.

This line was run along a dirt road by T. C. Thomas between October 19 and November 15, 1899. The results are given in detail in the Report of the Chief of Engineers for 1902, Part II, pages 1463-1465.

The leveling started from a permanent bench mark at Archibald, established in 1897-98, and connected at Columbia on four temporary bench marks. The new leveling indicated that some changes had occurred in the relative elevations of these bench marks and did not show which one, if any, was stable. T. B. M. 137, which showed a change about equal to the mean of all, was adopted as the junction point in the adjustment of the level net. The line extends as a spur 14 kilometers beyond Columbia to Three Rivers, La.

## CAMDEN, ARK., TO SHREVEPORT, LA.

This line was run by W. H. Polk between May 7 and July 17, 1900, along the St. Louis South-Western Railway. The results in detail are given in the Report of the Chief of Engineers for 1902, Part II, pages 1451-1453.

Two permanent bench marks at Camden, established in 1897, were recovered and the new difference of elevation was in exact accord with the difference then determined.

At Shreveport, two bench marks, established in 1889, were recovered, but the new difference does not agree with the old within the limits of accuracy of the leveling. One of these bench marks was also recovered in 1902 on the Coast and Geodetic Survey line from Fort Worth to Shreveport and found stable. It was decided, therefore, that the other bench mark, P. B. M. 45, had moved, and the elevation from the 1902 line only is adopted.

## GRAFTON TO CHICAGO, ILL.

This line was run as part of a survey to determine the feasibility of, and to prepare and report plans and estimates of the cost of, a navigable waterway from Lockport, Ill., to the mouth of the Illinois River.

A report upon the work and its results is published as House Document 263, Fifty-ninth Congress, first session.

The line was run by Fred Morley between November 1, 1902, and June 28, 1904.

From Grafton to Peoria the line followed the bluff road or the Chicago, Peoria and St. Louis Railway along the east side of the Illinois River. From Peoria to Joliet it followed the Chicago, Rock Island and Pacific Railway and the river road along the north side of the river. From Joliet to Chicago it followed the towpath of the Illinois and Michigan Canal or of the Chicago Drainage Canal.

The leveling redetermined P. B. M. 2 and P. B. M. 4 at Grafton, established in 1880. The new difference of elevation differed 17.5 millimeters from that determined in 1880. The distance is 4.3 kilometers. The leveling contained nothing to indicate which of the bench marks had changed in elevation in the interval. P. B. M. 2 was assumed unchanged and used as the junction point and the new elevation of P. B. M. 4 was adopted.

At Chicago connection was made on five bench marks established in 1883. For the details in regard to this connection see No. 286, in the "Condensed Statement of Direct Results of Observation," later in this publication.

#### AITKIN TO GRAND RAPIDS, MINN.

This line was run under the direction of the Mississippi River Commission by E. L. Harman between March 25 and June 27, 1902, and followed the state road. The results are given in the Report of the Chief of Engineers for 1903, Supplement, pages 74-96.

At Aitkin three permanent bench marks were recovered and found undisturbed. At Grand Rapids three bench marks, established in 1900, were recovered and found undisturbed.

The line completed the small circuit Aitkin-Cass Lake-Blackberry-Aitkin, which is on a spur from the precise level net and is not involved in the adjustment.

In the Report of the Chief of Engineers for 1905, Part VIII, pages 80-86, is printed a statement of an adjustment of the circuit closure with the resulting elevations. This adjustment was accepted in this publication.

#### UNITED STATES GEOLOGICAL SURVEY LINES.

The United States Geological Survey furnished the following information as to the methods, etc., of their new leveling:

The methods, kind of instruments, and limit of error used are those now adopted by the United States Coast and Geodetic Survey. On all sections upon which the forward and backward measures in millimeters differed more than  $4.0 \sqrt{K}$  (in which  $K$  is the distance between bench marks in kilometers), both forward and backward measures were repeated until a pair run in opposite directions came within limits, and all other requirements necessary to obtain accurate results were closely adhered to. In 1905 self-reading rods were used, 3.2 meters in length, graduated to centimeters and reading to millimeters by estimation, but in the work of 1906 self-reading rods of the same length were used, but graduated to hundredths of a yard and reading by estimation to thousandths, computations being made in feet, the equivalent limit of error expressed in feet being  $0.017 \sqrt{D}$  (where  $D$  is the distance in miles between bench marks).

#### PEKIN TO CHAMPAIGN, ILL.

This line was run in 1905 by E. L. McNair, along the Cleveland, Cincinnati, Chicago and St. Louis Railway. Connection was made at Pekin with a bench mark established by the Corps of Engineers, United States Army, with one previously set by the United States Geological Survey and with a city bench mark. These had all been determined on the line Grafton to Chicago. The differences of elevation determined by the United States Geological Survey showed a close agreement with those from the former leveling.

The principal maximum values of the total discrepancy (B-F) in the main line are:

Distance.	B-F.	B-F per kilometer.	Distance.	B-F.	B-F per kilometer.
<i>km.</i>	<i>mm.</i>	<i>mm.</i>	<i>km.</i>	<i>mm.</i>	<i>mm.</i>
8.3	+ 5.9	+0.71	73.0	-15.4	-0.21
46.0	+ 5.7	+ .12	93.3	-18.9	- .20
60.7	- 7.4	- .12			

## OLNEY TO CHAMPAIGN, ILL.

This line was run in 1906 by T. A. Green, over the Wabash Railroad. Connection was made at Olney with two bench marks of the Coast and Geodetic Survey. The observed difference between these bench marks by the Coast and Geodetic Survey in 1882 was  $B_s - II = +1.7402$  meters. The difference of elevation by the United States Geological Survey in 1906 was 5.767 feet = 1.7578 meters, a discrepancy of 17.6 millimeters on a distance of 0.4 kilometer. This shows probable movement of one of the bench marks. The elevations in the computation of the line by the United States Geological Survey were based on  $B_s$ , and it appears probable from its position that it is more stable than B. M. II. It was adopted as the junction point in the adjustment of the level net.

Connection was made at Champaign with two bench marks established in 1905 and they were found undisturbed.

The principal maximum values of the total discrepancy (B-F) in the main line were:

Distance.		B-F.		B-F per kilometer.
miles.	km.	ft.	mm.	mm.
27.1	43.6	+0.123	+ 37.5	+0.86
52.1	83.8	+0.160	+ 51.5	+ .61
107.0	172.2	+0.234	+101.8	+ .59
123.1	198.1	+0.387	+118.0	+ .60

## CHILLICOTHE TO COLUMBUS, OHIO.

This line was run in 1905 by E. L. McNair, over the Norfolk and Western Railway. It was connected with the Coast and Geodetic Survey leveling at Chillicothe on one bench mark. The principal maximum values of the total discrepancy (B-F) in the main line were:

Distance.			Distance.		
B-F.	B-F per kilometer.		B-F.	B-F per kilometer.	
km.	mm.	mm.	km.	mm.	mm.
22.0	+16.6	+0.75	72.6	-1.8	-0.02
62.8	+ 8.4	+ .13	At end 79.2	+2.4	+ .03

## PORTSMOUTH TO CHILLICOTHE, OHIO.

This line was run in 1906 by N. A. Campbell and W. H. Monahan, over the Norfolk and Western Railway. It was connected with the Coast and Geodetic Survey leveling at Chillicothe, on one bench mark, and at Portsmouth with the leveling along the Ohio River, on one bench mark.

The principal maximum values of the total discrepancy (B-F) in the main line were:

Distance.		B-F.		B-F per kilometer.
<i>miles.</i>	<i>km.</i>	<i>ft.</i>	<i>mm.</i>	<i>mm.</i>
16.4	26.4	+0.068	+17.6	+0.67
24.8	39.9	— .028	— 8.5	— .21
29.5	47.5	+ .048	+14.6	+ .31
40.5	65.8	— .044	—13.4	— .20
At end 49.6	79.8	— .054	—16.5	— .21

#### VALLEY CROSSING TO UHRICHSVILLE, OHIO.

This line was run by W. H. Monahan in 1906. It starts with a bench mark of the Chillicothe to Columbus line, at Valley Crossing. At Zanesville two bench marks of the Corps of Engineers, U. S. Army, were recovered with a close agreement of the two determinations of the difference of elevation. At Uhrichsville connection was made with the Baltimore and Ohio Railroad leveling on one bench mark.

The principal maximum values of the total discrepancy (B-F) in the main line were:

Distance.		B-F.		B-F per kilometer.
<i>miles.</i>	<i>km.</i>	<i>ft.</i>	<i>mm.</i>	<i>mm.</i>
19.6	31.5	—0.020	— 6.1	—0.19
29.5	47.5	+ .060	+21.0	+ .44
56.6	91.1	+ .106	+32.3	+ .35
70.0	112.7	+ .146	+44.5	+ .39
At end 134.4	216.3	+ .117	+35.7	+ .27

#### BALTIMORE AND OHIO RAILROAD LINES.

The leveling was all done by O. E. Carr over the lines of the Baltimore and Ohio Railroad, and the results were furnished to this office in manuscript by the Chief Engineer of the Baltimore and Ohio Railroad.

Throughout the season of 1903 the same instrument and rods were used as on the leveling from Hancock, Md., to Foley, Pa., in 1902.\* The instrument is a copy of the new Coast and Geodetic Survey precise level and the rods are Molitor self-reading precise level rods, graduated to hundredths of feet.

During the season of 1904 the same instrument was used. Coast and Geodetic Survey rods T and U were used from Cumberland to B. & O. 65, near Terra Alta, W. Va., on the line from Cumberland to Benwood. On the remainder of the line new Molitor rods were used.

The Molitor rods used in 1903 were stated by Mr. Carr to be of exact length as marked and to be found by the Bureau of Standards unchanged in length during the season.

The Molitor rods used in 1904 were longer than graduated by 0.0005 foot per foot. No statement is made of the measurements on which this value depends.

\* See Appendix 3, Report for 1903, p. 348.

Rods T and U were used during part of March and April, 1904. The value used in the computation for the mean length was 3.00115 meters, or an excess of 0.38 millimeter per meter.

These rods were determined by the Bureau of Standards as follows:

Date.	Rod T.	Rod U.
January, 1904.....	m. 3.0010	m. 3.0009
January, 1906.....	3.0015	3.0014

The value used is therefore very nearly the mean of these two determinations.

As in 1902, the methods of observation, limit of error, etc., were the same as in Coast and Geodetic Survey leveling, with one exception. In the latter part of 1903, on the line Warwick to Benwood, and on the line Cumberland to Benwood, a change was made by always reading the back rod first. Mr. Carr stated that this change was made solely to save time. The Coast and Geodetic Survey practice is to read the back rod first at one instrument station and the fore rod first at the next, and so on. See paragraph 14 of the general instructions, page 12. The purpose of this provision is to eliminate the effect of any rising or settling of the instrument. In these two lines, therefore, of the Baltimore and Ohio Railroad leveling, this systematic error has not been eliminated.

The accumulated discrepancy between the forward and back lines on all the leveling except the first 43 miles of Cumberland to Benwood had a plus sign and showed a steadily increasing value.

#### WASHINGTON, D. C., TO BALTIMORE, MD.

At Washington one bench mark established the previous year was recovered. In Baltimore the leveling was connected with the city leveling on two bench marks. Connection was made with sea level at Baltimore by the Coast and Geodetic Survey in 1905 (see p. 28). The line was continued from Baltimore to Philadelphia, but this portion, which would be a spur from the level net and which is without a check, was not included in this publication.

The accumulated discrepancy between the forward and backward line (B-F) at Baltimore was +0.0724 foot (+22.1 millimeters) on 40.7 miles (65.5 kilometers), or +0.34 millimeter per kilometer. The accumulated discrepancy at Philadelphia, the end of the line, was +0.1462 foot (+44.6 millimeters) on 136.4 miles (219.5 kilometers), or +0.62 millimeter per kilometer.

#### RELAY TO WASHINGTON JUNCTION, MD.

At Relay one bench mark established early in the same season was recovered. At Washington Junction three bench marks established the previous year were recovered and found undisturbed. This line closed a small circuit of Baltimore and Ohio Railroad leveling, namely, Washington-Relay-Washington Junction-Washington. The closing error was 0.0723 foot, or 22.0 millimeters, and the length of the circuit was 131.5 miles, or 213 kilometers.

The accumulated discrepancy between the forward and backward lines  $(B-F) = +0.1147$  foot ( $+35.0$  millimeters) on 59.3 miles (95.4 kilometers), or  $+0.37$  millimeter per kilometer.

FOLEY, PA., TO CHICAGO JUNCTION, OHIO.

At Foley one bench mark established the previous season was recovered. At Benvenue, Pa., near Pittsburg, a bench mark of the United States Geological Survey on the line Grafton-Pittsburg was recovered, and at East Akron Junction a bench mark of the United States Geological Survey on the line Cleveland to Canton was recovered. There were thus two connections with the precise level net. The line ended at Chicago Junction. In 1905 the line Chicago Junction to Deshler, run by the Coast and Geodetic Survey, connected it again with the net.

The portion of the line from Struthers to East Akron Junction was not used in the net. Although the circuit Struthers-East Akron Junction-Canton-Alliance showed no error larger than the classes of leveling involved allowed, there existed other leveling of the United States Geological Survey, of a grade lower than precise leveling, which, by circuits involving that part of the Baltimore and Ohio line, indicated some large mistake within these circuits or in the Baltimore and Ohio Railroad leveling. This leveling was therefore not included in the net.

WARWICK, OHIO, TO BENWOOD, W. VA.

At Warwick one bench mark, established earlier in the same season, was recovered. At Bridgeport a bench mark of the Ohio River line \* was recovered. At Uhrichsville connection was made later by the United States Geological Survey on one bench mark of this line.

The accumulated discrepancy was  $+0.1085$  feet ( $+33.1$  millimeters) on 110.1 miles (177.2 kilometers) or  $+0.19$  millimeter per kilometer.

When the level net was adjusted it was found that the part of this line from Uhrichsville to Benwood, forming equation 72, received a very large correction, and that the  $pv^2$  (weighted square of the residual) was so large that it indicated that the line was very near the limit for rejection but not sufficiently large to show that it should be rejected. It was, therefore, retained. But on account of this large correction and the consequent probability of a large mistake in the line it was decided not to publish any elevations along this line.

CUMBERLAND, MD., TO BENWOOD, W. VA.

At Cumberland two bench marks established in 1902 were recovered and the new determination of the difference of elevation agreed with the old within the limit of accuracy of the leveling. At Benwood one bench mark established the previous year was recovered, and connection was again made with the Ohio River line on a bench mark at Benwood. At Amblersburg and at Grafton connection was made, on one bench mark at each place, with the Coast and Geodetic Survey leveling of 1879.

\* See Appendix 3, Report for 1903, page 347.



The accumulated discrepancy between the forward and backward lines (B-F) at the end of the line was 0.4882 foot (+148.8 millimeters) on 198.3 miles (319.1 kilometers) or +0.47 millimeter per kilometer. This is the only line of the Baltimore and Ohio Railroad leveling which shows any minus discrepancy. For the first 43 miles of the line the accumulated discrepancy is sometimes plus and sometimes minus, the maximum plus being +13 millimeters at 11.6 miles and the maximum minus being -15 millimeters at 30.1 miles.

#### ZANESVILLE TO MARIETTA, OHIO.

The Director of the United States Geological Survey transmitted to this office, from a line furnished him by the Chief of Engineers, the elevations, descriptions, and distances from the mouth of the Muskingum River, of one bench mark at Belpre, one at Marietta, and two on Lock 10 at Zanesville. No particulars are known at this office of the methods of the work, but it is understood to be of the same class as the leveling along the Ohio River.\*

#### MONACA, PA., TO LIMA, OHIO.

In 1903 there was included in the level net a line run by the Pittsburgh, Fort Wayne and Chicago Railroad from Monaca, Pa., to Lima, Ohio, with which the United States Geological Survey line from Canton to Cleveland was connected.

When the Coast and Geodetic Survey lines in Pennsylvania and Ohio were run, in 1906,† it was found that the new determinations of the difference of elevation between bench marks of this line differed widely from those determined by the railroad leveling, indicating either changes in the bench marks or large inaccuracies in the leveling. The United States Geological Survey had run many lines of levels, of a grade lower than precise leveling, in this region and the circuits formed by this leveling with sections of the line Monaca to Canton all indicated errors in the latter line and showed that it was not of sufficient accuracy to be considered as precise leveling. For these reasons the portion of this line from Alliance to Lima was omitted from the level net. After the new leveling at Alliance and near Monaca was substituted for the old, it was found that the circuit closures were within reasonable limits and that the difference of elevation between the stable bench marks at the two points was probably correct. The portion of the line from Monaca to Alliance was therefore retained in the net, but on account of the uncertainty of the stability of many of the intermediate bench marks the elevations along the line are not published. The elevations on pages 568-571 of Appendix 3, Report for 1903, are therefore no longer to be used.

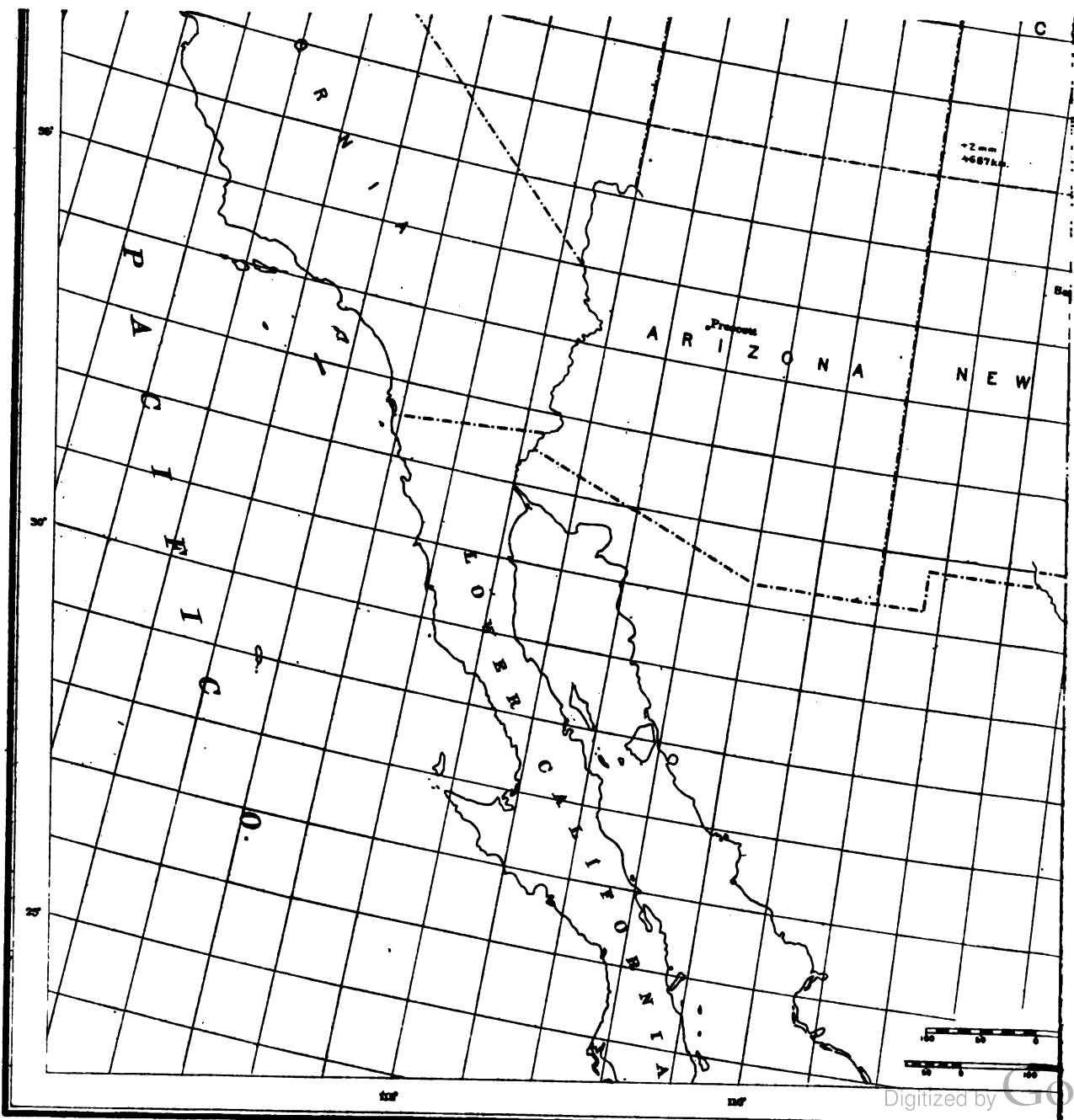
#### CONDENSED STATEMENT OF DIRECT RESULTS OF OBSERVATION.

On the following pages are shown in condensed form for convenient reference the direct results of all the leveling which is included in the level net in this publication. All lines introduced into the net for the first time in this adjustment are indicated by italics.

\* See Appendix 3, Report for 1903, page 347.

† See page 40.





The numbering of the lines repeated from Appendix 8, Report for 1899, and Appendix 3, Report for 1903, has been retained unchanged as far as possible.

For each long line of leveling there are stated in tabular form the location and designation of the terminal bench marks, the distance between them measured along the level line, the observed difference of elevation, and a reference to the authority from which these facts are obtained. A plus sign on the difference of elevation indicates that the first-named bench mark is higher than the second.

As the desirable information in regard to tide observations and in regard to the observations fixing the relations between certain bench marks which are common to two or more level lines at their junction points can not conveniently be put in this tabular form, it is placed immediately after it in paragraphs, which are numbered to correspond with the relation which they bear to the tabular matter. The numbers assigned in the tabulation and the following paragraphs serve also to indicate approximately the order in which the corrected elevations and descriptions of bench marks are given.

Another distinction may also be made between the paragraphic matter and the tabular matter. All elevations or relative elevations which are stated in the paragraphic matter are determined by the observations with so high a degree of accuracy, as compared with the relative elevations stated in the tabular matter, that they are treated as fixed quantities in the adjustment, or, in other words, are assigned infinite weight.

The lines of leveling are also shown on the sketch opposite. The lines have been drawn nearly in their true location, but the drawing has necessarily been somewhat generalized and in a few cases it has been necessary to exaggerate distances between points in order to make them show as separate points. The various symbols used in drawing the lines serve to show by what organizations they were run. "U. S. Engineer Precise Leveling" includes the precise leveling done under the direction of the Corps of Engineers, U. S. Army; the Mississippi River Commission, and the Missouri River Commission. "U. S. Engineer Wye Leveling" includes wye leveling done under the direction of the Corps of Engineers, U. S. Army, and the Board of Engineers on Deep Waterways.

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		<i>km.</i>		<i>m.</i>	
2	Raritan Bay, N. J.....	267	F.....	-106.3911	C. and G. S. Rep. 1882, pp. 525-528.
	Harrisburg, Pa.....		XXIX.....		
3	Harrisburg, Pa.....	119	XXIX.....	- 59.5851	Ibid., 1882, pp. 528-529.
	Hagerstown, Md.....		A.....		
4B	Cumberland, Md.....	94	I.....	+ 61.8102	Ibid., 1882, pp. 533-535.
	Hancock, Md.....		F.....		
4C	Hancock, Md.....	50	F.....	- 40.0451	Ibid., 1882, p. 533.
	Hagerstown, Md.....		A.....		
4D	Grafton, W. Va.....	48	M.....	-191.1506	Ibid., 1882, p. 537.
	Amblersburg, W. Va.....		L.....		
4E	Amblersburg, W. Va.....	116	L.....	+304.9094	Ibid., 1882, pp. 535-537.
	Cumberland, Md.....		I.....		
7A	Lawrenceburg, Ind.....	329	U.....	- 0.2283	Ibid., 1882, pp. 547-552.
	Olney, Ill.....		B <sub>1</sub> .....		
7B	Olney, Ill.....	85	B <sub>1</sub> .....	- 12.8461	Ibid., 1882, p. 552.
	Odin, Ill.....		V.....		
8	Odin, Ill.....	104	V.....	+ 34.4398	Ibid., 1882, pp. 552-554.
	St. Louis, Mo.....		K <sub>2</sub> .....		
9	St. Louis, Mo.*.....	205	K <sub>2</sub> .....	- 43.6058	Ibid., 1893, Pt. 2, pp. 23-32; 1896, p. 268.
	Jefferson City, Mo.....		90 (85)		

\*This includes a local adjustment of two runnings between M<sub>2</sub> and XIV near New Haven, Mo. (See C. and G. S. Rep. 1893, pp. 26, 28.)

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		km.		m.	
11	Jefferson City, Mo.	198	XXVIII.	- 69.6683	C. and G. S. Rep., 1896, pp. 268-273.
	Pleasant Hill, Mo.		LI		
13	Kansas City, Mo.	45	LVIII.	- 32.0065	Ibid., 1896, pp. 273-275.
	Pleasant Hill, Mo.		LII		
15A	Kansas City, Mo.	23	244	- 2.9290	Ibid., 1896, p. 275.
	Holliday, Kans.		LXII		
16	Holliday, Kans.	239	LXIII.	-120.1134	Ibid., 1897, pp. 273-278.
	Abilene, Kans.		B <sub>1</sub>		
20	Salina, Kans.	188	H <sub>1</sub>	-272.6940	Ibid., 1897-98, p. 190.
	Ellis, Kans.		A <sub>2</sub>		
22	Ellis, Kans.	372	B <sub>2</sub>	-891.8633	Ibid., 1897-98, pp. 201-209.
	Hugo, Colo.		K		
23	Hugo, Colo.	25	K	- 93.8534	Ibid., 1897-98, p. 221.
	Limon, Colo.		N		
25	Limon, Colo.	123	P	-214.1380	Ibid., 1897-98, pp. 221-224.
	Colorado Springs, Colo.		Z		
26	Colorado Springs, Colo.	121	Z	+267.8229	Ibid., 1899, pp. 385-388.
	Denver, Colo.		Z <sub>1</sub>		
28	Limon, Colo.	141	N	+ 46.4068	Ibid., 1899, pp. 389-392.
	Denver, Colo.		Z <sub>1</sub>		
30	Mobile, Ala.	93	A	- 1.0250	Ibid., 1887, pp. 188-190.
	Biloxi, Miss.		E <sub>1</sub>		
31	Meridian, Miss.	219	C	+101.1643	Ibid., 1888, pp. 411-417.
	Mobile, Ala.		A		
32	Corinth, Miss.	314	V	+ 32.3287	Ibid., 1888, pp. 418-422; 1892, Pt. 2, pp. 165-169.
	Meridian, Miss.		C		
34	Cairo, Ill.	265	1	- 41.1591	Ibid., 1892, Pt. 2, pp. 169-181.
	Corinth, Miss.		W		
36	Odin, Ill.	194	V	+ 63.0832	Ibid., 1892, Pt. 2, pp. 181-189.
	Cairo, Ill.		2		
44	Greenville, Miss.	185	1	+ 12.1193	Ibid., 1888, pp. 443-450.
	Vicksburg, Miss.		211		
46	Little Rock, Ark.	181	3 (or I)	+ 38.0703	Ibid., 1888, pp. 457-461.
	Arkansas City, Ark.		F		
48	Van Buren, Ark.	261	XXXVIII.	+ 46.1848	Ibid., 1888, pp. 461-462; 1899, pp. 362-368.
	Little Rock, Ark.		3 (or I)		
50	Van Buren, Ark.	9	XXXIX.	- 10.1563	Ibid., 1899, p. 368.
	Fort Smith, Ark.		XLI		
51	Chester, Ark.	40	XLVIII.	+131.2299	Ibid., 1899, p. 369.
	Van Buren, Ark.		XXXIX		
53	Boston, Mo.	252	KCVII.	+ 27.5842	Ibid., 1899, pp. 377-382.
	Chester, Ark.		XLIX		
55	Harrisonville, Mo.	145	43	+ 26.8493	Ibid., 1899, pp. 373-376.
	Boston, Mo.		KCVI		
56	Pleasant Hill, Mo.	13	LI.	- 48.3294	Ibid., 1899, p. 372.
	Harrisonville, Mo.		43		
57A	Holliday, Kans.	75	LXII.	- 76.4558	Ibid., 1899, pp. 370-372.
	Harrisonville, Mo.		43		
59A	Hagerstown, Md.	129	A	+158.4543	Ibid., 1896, pp. 257, 262-263.
	Georgetown, D. C.		XI		
59B	Georgetown, D. C.	8	XI	- 18.0040	Ibid., 1896, p. 251.
	Washington, D. C.		Capitol		
61A	Georgetown, D. C.	185	XI	- 49.1571	Ibid., 1896, pp. 248-255.
	Richmond, Va.		O	- 49.1894	
				- 48.7662	
				- 48.7662	
63	Richmond, Va.	140	O	+ 55.4955	Ibid., 1896, pp. 239-244.
	Old Point Comfort, Va.		U	- 49.1894	
				+ 55.5318	
				- 0.2536	
34	St. Augustine, Fla.	216	Sea level	- 0.2536	Ibid., 1899, p. 397.
	Cedar Keys, Fla.		Sea level		
65	Meridian, Miss.	224	C	+ 45.5885	Ibid., 1899, pp. 354-360.
	Vicksburg, Miss.		Cistern		
66	Corinth, Miss.	151	W	+ 57.2388	Ibid., 1892, Pt. 2, pp. 207-219.
	Memphis, Tenn.		Memphis		
68	Annapolis, Md.	63	a	- 26.3500	Ibid., 1899, p. 463.
	Washington, D. C.		Capitol		
70A	Norfolk, Nebr.	466	N <sub>1</sub>	+113.4466	Ibid., 1899, pp. 306-319
	Abilene, Kans.		Y <sub>2</sub>		
72C	Gibraltar, Mich.	124	1 (1898)	- 38.2539	Ibid., 1899, p. 340.
	Deshler, Ohio.		I <sub>1</sub>		
72D	Deshler, Ohio.	272	I <sub>1</sub>	+ 50.8004	Ibid., 1899, pp. 340-342.
	Cincinnati, Ohio.		T		
74A	Monroe, La.	140	27	- 38.3101	Ch. of Eng. Rep. 1893, Pt. 3, pp. 1852-1853; 1902, Pt. 2, p. 1457.
	Bodcau, La.		P. B. M. 44		
74D	Shreveport, La.	315	P. B. M. 46	+ 35.4849	Ibid., 1902, Pt. 2, pp. 1457-1459.
	Barbin Landing, La.		T. B. M. 53		
74E	Barbin Landing, La.	67	T. B. M. 53	+ 9.3550	Ibid., 1902, Pt. 2, pp. 1459-1460.
	Smithland, La.		XLV		
76	Monroe, La.	34	24	- 4.9980	Ibid., 1893, Pt. 3, pp. 1945-1946; 1902, Pt. 2, pp. 1456, 1457.
	Rayville, La.		17		

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		km.		m.	
78	Rayville, La.	79	16.....	- 2.1750	Ch. of Eng. Rep., 1893, Pt. 3, p. 1945;
	Vicksburg, Miss.		SW. Base		1902, Pt. 2, p. 1456.
79	Concordia, La.	11	9.....	- 0.1609	Ibid., 1902, Pt. 2, p. 1466.
	Vidalia, La.		LXIV		
80A	Monroe, La.	61	27.....	+ 5.5998	Ibid., 1902, Pt. 2, p. 1450.
	Columbia, La.		137		
80B	Columbia, La.	78	137.....	+ 1.7178	Do.
	Jonesville, La.		P. B. M. 4		
90C	Jonesville, La.	29	P. B. M. 4.....	- 3.1422	Ibid., 1902, Pt. 2, p. 1466.
	Concordia, La.		9		
81A	Rayville, La.	15	17.....	+ 3.3802	Ibid., 1902, Pt. 2, p. 1463.
	Archibald, La.		P. B. M. Archibald		
81B	Archibald, La.	95	P. B. M. Archibald...	+ 3.9656	Do.
	Concordia, La.		9		
83A	Jonesville, La.	54	P. B. M. 4.....	+ 1.5342	Ibid., 1902, Pt. 2, pp. 1450-1451.
	Acme, La.		P. B. M. 12a		
84	Shreveport, La.	44	P. B. M. 46.....	- 0.4581	Ibid., 1902, Pt. 2, p. 1465.
	Jeters Landing, La.		P. B. M. 4		
86	Parkeville, La.	34	Parkeville.....	+ 1.7471	Ibid., 1902, Pt. 2, p. 1448.
	Monroe, La.		24		
87	Glendora, La.	42	P. R. P. Glendora.....	- 4.7268	Ibid., 1902, Pt. 2, pp. 1455, 1456.
	Farmerville, La.		P. B. M. Stein		
88A	Little Rock, Ark.	186	3 (or I).....	+ 45.2904	Ibid., 1902, Pt. 2, p. 1449.
	Camden, Ark.		P. B. M. Camden IV		
88B	Camden, Ark.	152	P. B. M. Camden IV..	+ 11.5171	Ibid., 1902, Pt. 2, pp. 1448-1449.
	Parkeville, La.		Parkeville		
89	Wilkersons Landing, Miss.	163	84.....	+ 17.4850	Ibid., 1902, Pt. 2, pp. 1454, 1455.
	Parkeville, La.		74		
90	Greenville, Miss.	32	1.....	- 2.3115	Ibid., 1883, Pt. 3, pp. 2183, 2184.
	Wilkersons Landing, Miss.		84		
91	Greenville, Miss.	33	1.....	- 2.3033	Ibid., 1902, Pt. 2, p. 1455.
	Wilkersons Landing, Miss.		84		
92	Vicksburg, Miss.	269	P. B. M. 2.....	- 10.5820	Ibid., 1894, Pt. 3, pp. 1497-1499; 1902,
	Greenville, Miss.		1		Pt. 2, pp. 1460-1462.
93	Wilkersons Landing, Miss.	153	84.....	- 12.9985	Ibid., 1883, Pt. 3, pp. 2177-2183.
	Friar Point, Miss.		II		
94	Friar Point, Miss.	32	II.....	+ 2.5680	Ibid., 1902, Pt. 2, p. 1467.
	Clarkdale, Miss.		III		
96	Friar Point, Miss.	134	II.....	- 25.3792	Ibid., 1879, Pt. 3, p. 1944; 1878, Pt. 3,
	Memphis, Tenn.		Memphis		p. 1392
99	Riverton Junction, Ala.	63	T. B. M. 44.....	- 1.1236	Ibid., 1896, Pt. 3, pp. 1999-2011.
	Pittsburg Landing, Tenn.		P. B. M. 61		
100	Meridian, Miss.	42	C.....	+ 57.4130	Ibid., 1899, Pt. 2, pp. 1779-1781.
	York, Ala.		P. B. M. 26		
101	York, Ala.	207	P. B. M. 26.....	- 138.5920	Ibid., 1899, Pt. 2, pp. 1770-1779.
	Birmingham, Ala.		P. B. M. 1		
102	York, Ala.	46	P. B. M. 26.....	+ 8.7319	Ibid., 1899, Pt. 2, pp. 1781-1783.
	Demopolis, Ala.		P. B. M. 6		
103	Memphis, Tenn.	330	Memphis.....	- 16.7198	Miss. Riv. Com. Rep. 1881, pp. 52-63;
	Cairo, Ill.		P. B. M. 2		Ch. of Eng. Rep. 1883, Pt. 3, pp.
					2187-2188.
104	Cairo, Ill.	275	P. B. M. 1.....	- 29.2737	Ch. of Eng. Rep. 1884, Pt. 4, pp. 2480-
	St. Louis, Mo.		K.		2499.
105	St. Louis, Mo.	21	K.....	- 13.3904	Ibid., 1884, Pt. 4, pp. 2479-2480; 1898,
	12 miles above St. Louis, Mo.		P. B. M. 12		Pt. 4, p. 2328. (Mean of these two
					measures used.)
106A	12 miles above St. Louis, Mo.	47	P. B. M. 12.....	+ 6.3495	Ibid., 1884, Pt. 4, pp. 2476-2479.
	Grafton, Ill.		P. B. M. 3		
106B	Grafton, Ill.	504	P. B. M. 3.....	- 49.2893	Ibid., 1884, Pt. 4, pp. 2499-2534.
	Albany, Ill.		P. B. M. 53		
108	Albany, Ill.	6	P. B. M. 53.....	+ 4.9232	Ibid., 1884, Pt. 4, p. 2534; 1885, Pt. 4,
	Fulton, Ill.		P. B. M. 56		p. 2652. (Mean of these two meas-
					ures used.)
110	Fulton, Ill.	31	P. B. M. 56.....	- 2.9032	Ibid., 1885, Pt. 4, pp. 2652-2654.
	Savanna, Ill.		P. B. M. 62		
112	Savanna, Ill.	224	P. B. M. 62.....	+ 0.2105	Ibid., 1885, Pt. 4, pp. 2654-2669.
	Chicago, Ill.		P. B. M. 99		
113	Savanna, Ill.	478	P. B. M. 62.....	- 33.8437	Ibid., 1892, Pt. 4, pp. 2958-3037.
	St. Paul, Minn.		P. B. M. 68		
116	St. Paul, Minn.	250	P. B. M. 68.....	+ 23.1902	Ibid., 1892, Pt. 4, pp. 3074-3098.
	Duluth, Minn.		1		
118	Marquette, Mich.	105	1.....	+ 5.1567	Prof. Papers No. 24 (U. S. Lake Sur-
	Essex, Mich.		1		vey Rep.), pp. 603-604.
120	12 miles above St. Louis, Mo.	224	P. B. M. 12.....	- 52.1251	Ch. of Eng. Rep. 1883, Pt. 4, p. 2328;
	Jefferson City, Mo.		XXVIII (Capitol)		1893, Pt. 6, pp. 4046-4082.
121	Jefferson City, Mo.	306	90 (85).....	- 58.2482	Ibid., 1893, Pt. 6, pp. 3988-4045.
	Kansas City, Mo.		LVIII		
122	Kansas City, Mo.	113	244.....	- 19.0180	Ibid., 1893, Pt. 6, pp. 3964-3988.
	St. Joseph, Mo.		P. B. M. 287		
124	St. Joseph, Mo.	366	P. B. M. 290.....	- 85.1170	Ibid., 1893, Pt. 6, pp. 4138-4208.
	St. Joseph, Mo.		P. B. M. 399		
133A	Greenbush, N. Y.	11	Gristmill.....	- 3.0162	C. and G. S. Rep. 1903, pp. 297, 298.
	Troy, N. Y.		D. W. Troy 2		

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		km.		m.	
133C	Troy, N. Y.	106	N. Y. 12.	- 25.1211*	Rep. on Deep Waterways 1900, Pt. II, pp. 1017, 1023, 1025.
	Whitehall, N. Y.	(60 mi.)	U. S. C. S. 36	(- 82.418 ft.)	N. Y. State Eng. Rep. 1901, pp. 653, 671, 675.
133D	Whitehall, N. Y.	60	U. S. C. S. 36.	- 8.0071	Rep. on Deep Waterways 1900, Pt. II, pp. 1025-1026.
133E	Crown Point, N. Y.	(37.2 mi.)	L. H.	(- 26.27 ft.)	Ibid., Pt. I, pp. 393-398; Pt. II, p. 1026.
133F	Coopersville, N. Y.	(63.9 mi.)	D. W. Coopersville	(+ 27.78 ft.)	Ibid., Pt. II, pp. 1026-1029.
133G	Coopersville, N. Y.	126	D. W. Coopersville.	- 23.2380	
	Hogansburg, N. Y.	(78.5 mi.)	U. S. P.	(- 76.24 ft.)	
	Hogansburg, N. Y.	193	U. S. P.	- 26.0919†	MS. furnished by Ch. of Eng., Mar., 1900.
133H	Tibbetts Pt., N. Y.	73	P. B. M. 35	- 3.6430	Ibid., Mar., 1903.
135	Oswego, N. Y.	73	A.	- 3.6430	
	Tibbetts Point, N. Y.		P. B. M. 35		
135	Greenbush, N. Y.	320	Gristmill.	+ 4.2898	Rep. Top. Surv. Mass., 1893.
	Boston, Mass.		Sea level	(+ 14.074 ft.)	
138A*	Dunkirk, N. Y.	76	598 D.	- 241.4932	MS. furnished by U. S. Geol. Surv., Feb., 1903.
138B	Salamanca, N. Y.		1391 D.	+ 75.9076	Do.
138C	Salamanca, N. Y.	131	1391 D.	+ 75.9076	Do.
138C	Hornellsville, N. Y.		1141 D.	+ 86.5039	Do.
138D	Hornellsville, N. Y.	94	1141 D.	+ 86.5039	Do.
	Elmira, N. Y.		857 A.	- 2.2659	Do.
138E	Elmira, N. Y.	94	857 A.	- 2.2659	Do.
	Binghamton, N. Y.		867 A.	- 37.7005	Do.
138F	Binghamton, N. Y.	60	867 A.	- 37.7005	Do.
	Bainbridge, N. Y.		989 A.	+ 243.4220	Do.
138F	Bainbridge, N. Y.	168	989 A.	+ 243.4220	Do.
	Vischers Ferry, N. Y.	(104.6 mi.)	L. S. 18		
140B	Leboeuf, Pa.	36	1193 P.	+ 183.0081	Do.
	Erie, Pa.		L. H.		
140C	Franklin, Pa.	86	987 P.	- 62.8310	Do.
	Leboeuf, Pa.		1193 P.		
140D	West Penn Junction, Pa.	150	P. R. R. 26.	- 60.6127	Do.
	Franklin, Pa.		987 P.		
142B	Braddock, Pa.	201	P. R. R. 88.	- 17.1478	Do.
	Benton Ferry, W. Va.		885 Pittsburg	(- 56.259 ft.)	
143A	Braddock, Pa.	70	P. R. R. 88.	- 88.7061	Pa. R. R. B. M. Book, pp. 71-74.
143B	Blairsville Intersec., Pa.	(43 mi.)	P. R. R. 47	- 100.9072	Ibid., pp. 77-80.
143C	West Penn Junction, Pa.	68	P. R. R. 26.	- 100.9072	Ibid., pp. 46-71.
	Blairsville Intersec., Pa.	(42 mi.)	P. R. R. 47	+ 238.6040	
143C	Blairsville Intersec., Pa.	314	P. R. R. 47.	+ 238.6040	
	Harrisburg, Pa.	(196 mi.)	P. R. R. 2		
144	New Orleans, La.	135	Halfway House.	- 3.1523	Ch. of Eng. Rep. 1900, Pt. 7, pp. 4631-4645.
	Biloxi, Miss.		Ei		
145	Baton Rouge, La.	144	XXXII.	+ 6.9856	Ibid., 1900, Pt. 7, pp. 4682-4708.
	New Orleans, La.		Halfway House		
146	Smithland, La.	104	XLV.	+ 6.1987	Ibid., 1900, Pt. 7, pp. 4709-4721.
147	Baton Rouge, La.		XXXII.	+ 6.0760	Ibid., 1900, Pt. 7, pp. 4721-4725.
	Fort Adams, Miss.	24	XLIX.		
	Smithland, La.		XLV.		
150	Decatur, Ala.	139	P. B. M. 50.	- 11.9243	C. and G. S. Rep. 1903, pp. 249-251.
	Birmingham, Ala.		P. B. M. 2		
151	Tuscumbia, Ala.	86	P. B. M. 9.	+ 5.5652	Ibid., 1903, pp. 286-290; Ch. of Eng. Rep. 1896, Pt. 3, pp. 1982-1998.
	Corinth, Miss.		V		
152	Decatur, Ala.	86	P. B. M. 50.	+ 26.4098	Ch. of Eng. Rep. 1896, Pt. 3, pp. 1982-1998.
	Tuscumbia, Ala.		P. B. M. 9		
153	Decatur, Ala.	72	P. B. M. 50.	+ 26.4103	C. and G. S. Rep. 1903, pp. 284-286.
	Tuscumbia, Ala.		P. B. M. 9		
155	Sioux City, Iowa.	116	B.	- 127.0836	Ibid., 1903, pp. 252-256.
	Norfolk, Nebr.		2		
157A	Decatur, Ala.	196	P. B. M. 50.	- 41.5760	Ibid., 1903, pp. 244-249.
	Chattanooga, Tenn.		698 N		
157B	Chattanooga, Tenn.	128	698 N.	- 30.3215	Ibid., 1903, pp. 242-244.
	Harriman Junction, Tenn.		C.		
159	Cincinnati, Ohio.	412	C.	- 72.1931	Ibid., 1903, pp. 230-239.
	Harriman Junction, Tenn.		A.		
160	Knoxville, Tenn.	81	933 M C.	+ 42.5945	Ibid., 1903, pp. 239-240.
	Harriman Junction, Tenn.		C.		
162	Morehead City, N. C.	863	7 M C.	- 262.0148	U. S. Geol. Surv., 20th Ann. Rep. Pt. 1, pp. 376-378.
	Caswell, Tenn.		867 M C.	(- 859.627 ft.)	
164A	Wright, Tenn.	120	940 M C.	+ 20.0138	Ibid., p. 378.
	Cleveland, Tenn.		875 M C.	(+ 65.662 ft.)	
164B	Cleveland, Tenn.	671	875 M C.	+ 263.4319	Ibid., pp. 378-380.
	Brunswick, Ga.		10 M C.		
166A	Belpre, Ohio.	158	XL.	- 5.1780	C. and G. S. Rep. 1882, pp. 542-545.
	Chillicothe, Ohio.		Q		

\* In combining, the D. W. leveling was given twice as much weight as the New York State leveling. The weight assigned to the portion of the line Oswego-Greenbush is  $\frac{750}{L}$ , as it consists of three runnings instead of two. See page 628 of the State Engineer's Report.

† The difference of elevation, -26.0940 meters, obtained by converting 85.61 feet from the tabulation of this line in the Report of the Deep Waterways 1900, Part II, pages 1029-1036, was used by mistake in establishing the equations. The difference is due to the conversion of the original meters into feet and keeping the hundredths only, and then the conversion of the approximate feet into meters again. The mistake was not discovered until too late to correct the equations, but the true value was used in distributing the correction on the line and in forming the circuit closure.

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		km.		m.	
166B	Chillicothe, Ohio.....	158	Q.....	+ 27.9232	C. and G. S. Rep., 1882, pp. 545-546.
	Cincinnati, Ohio.....		T.....		
167A	Belpre, Ohio.....	272	XL.....	+ 28.1723	Leveling of U. S. E., submitted by
	Portsmouth, Ohio.....	(169 mi.)	U. S. E.....	(+ 35.967 ft.)	U. S. Geol. Surv.
167B	Portsmouth, Ohio.....	222	U. S. E.....	+ 14.9800	Do.
	Lawrenceburg, Ind.....	(138 mi.)	U.....	(+ 49.147 ft.)	
168	Grafton, W. Va.....	170	M.....	+114.4023	C. and G. S. Rep. 1882, pp. 540-542.
	Belpre, Ohio.....		XL.....		
169A	Monaca, Pa.....	40	25 C.....	- 17.5190	MS. furnished by Ch. of Eng. and by
	Pittsburg, Pa.....	(25 mi.)	P. R. R. 100.....	(- 57.477 ft.)	U. S. Geol. Surv.
169C	Benwood, W. Va.....	111	94 A.....	- 11.6321	Leveling by U. S. E.; results submit-
	Monaca, Pa.....		25 C.....	(- 38.163 ft.)	ted by U. S. Geol. Surv.
169D	Marietta, Ohio.....	124	171 B.....	- 17.2703	Do.
	Benwood, W. Va.....		94 A.....	(- 56.661 ft.)	
170A	Dobbs Ferry, N. Y.....	87	V.....	- 49.7925	C. and G. S. Rep. 1903, pp. 291-294
	Poughkeepsie, N. Y.....		173 A.....		
170B	Poughkeepsie, N. Y.....	116	173 A.....	+ 48.5028	Ibid., 1903, pp. 294-297.
	Greenbush, N. Y.....		Gristmill.....		
171	Page, Nebr.....	103	K <sub>3</sub> .....	+131.2314	Ibid., 1903, pp. 257-259.
	Norfolk, Nebr.....		O <sub>1</sub> .....		
172	Chadron, Nebr.....	427	C <sub>2</sub> .....	+421.1151	Ibid., 1903, pp. 268-276.
	Page, Nebr.....		K <sub>3</sub> .....		
173	Orin Junction, Wyo.....	201	T <sub>1</sub> .....	+412.7186	Ibid., 1903, pp. 299-302.
	Chadron, Nebr.....		C <sub>1</sub> .....		
174	Cheyenne, Wyo.....	247	B.....	+417.1586	Ibid., 1903, pp. 278-283.
	Orin Junction, Wyo.....		T <sub>1</sub> .....		
175	Denver, Colo.....	169	A <sub>1</sub> .....	-262.6197	Ibid., 1899, pp. 289-293.
	Cheyenne, Wyo.....		B.....		
176	Cheyenne, Wyo.....	172	B.....	-195.7606	Ibid., 1899, pp. 293-297.
	Rock Creek, Wyo.....		U.....		
178	Anthony, Kans.....	215	SE. Base.....	+ 45.7929	Ibid., 1903, pp. 261-266.
	Salina, Kans.....		H <sub>1</sub> .....		
180	Bowie, Tex.....	431	1124 Galv.....	- 67.2614	Ibid., 1903, pp. 304-315.
	Anthony, Kans.....		F.....		
181A	St. Paul, Minn.....	128	P. B. M. 68.....	-100.5379	Ch. of Eng. Rep. 1899, Pt. 5, pp. 3420-
	St. Cloud, Minn.....		P. B. M. St. Cloud.....	3440.	
181B	St. Cloud, Minn.....	119	P. B. M. St. Cloud.....	- 52.1694	Ibid., 1899, Pt. 5, pp. 3440-3457.
	Brainerd, Minn.....		North Base.....		
182	Brainerd, Minn.....	68	North Base.....	- 3.6394	Ibid., 1899, Pt. 5, pp. 3457-3468; 1905,
	Aitkin, Minn.....		P. B. M. Courthouse.....		Supp., pp. 80, 86.
183A	Cass Lake, Minn.....	129	T. B. M. 92.....	+ 40.0211	Ibid., 1901, Supp., pp. 71-85; 1905,
	Brainerd, Minn.....		North Base.....		Supp., pp. 80, 83.
184A	Lake Itasca, Minn.....	76	Park House.....	+ 46.9142	Ibid., 1901, Supp., pp. 85-96; 1905,
	Cass Lake, Minn.....		T. B. M. 92.....		Supp., pp. 80, 83, 84.
185A	Grand Rapids, Minn.....	98	T. B. M. 230.....	- 9.9462	Ibid., 1901, Supp., pp. 97-111; 1905,
	Cass Lake, Minn.....		T. B. M. 92.....		Supp., pp. 80, 84, 85.
186	Shreveport, La.....	410	P. B. M. 46.....	-124.9945	C. and G. S. Rep. 1903, pp. 319-328.
	Fort Worth, Tex.....		U.....		
187	Fort Worth, Tex.....	109	U.....	-157.9008	Ibid., 1903, pp. 317-319.
	Bowie, Tex.....		1124 Galv.....		
188	Fort Worth, Tex.....	75	U.....	+ 89.9821	Ibid., 1903, pp. 329-330.
	Comanche, Tex.....		Comanche.....		
189	Cleveland, Tenn.....	50	875 M C.....	+ 55.1436	MS. furnished by U. S. Geol. Surv.,
	Chattanooga, Tenn.....		698 N.....		Feb., 1903.
190A	Alliance, Ohio.....	94	Br. 66.....	+124.9438	Leveling of the Pitts. Ft. W. and Ch.
	Monaca, Pa.....		25 C.....	(+ 409.920 ft.)	R. R., submitted by U. S. Geol. Surv.
192A	Canton, Ohio.....	36	Br. 77.....	+ 19.9553	MS. furnished by U. S. Geol. Surv.,
	E. Akron Jct., Ohio.....		Wall.....	(+ 65.470 ft.)	Feb., 1903.
192B	E. Akron Jct., Ohio.....	60	Wall.....	+117.6680	Do.
	Cleveland, Ohio.....		U. S. E. 2.....	(+ 398.049 ft.)	
194	Duluth, Minn.....	470	No. 1.....	+ 5.0841	MS. furnished Mar. 2, 1903, by Ch. of
	Marquette, Mich.....		No. 1.....		Eng. from U. S. Lake Survey.
195	Escanaba, Mich.....	500	No. 1.....	+ 3.1775*	Do.
	Sand Beach, Mich.....		E.....		
196	Milwaukee, Wis.....	720	No. 1.....	+ 3.0279	Do.
	Sand Beach, Mich.....		E.....		
197	Chicago, Ill.....	130	99.....	- 0.4404	Do.
	Milwaukee, Wis.....		No. 1.....		
198	Marquette, Mich.....	240	No. 1.....	+ 0.6770	Do.
	Iroquois, Mich.....		Iroquois.....		
199	Iroquois, Mich.....	126	Iroquois.....	+ 1.7274	Do.
	Detour, Mich.....		Goetz.....		
200	Mackinaw, Mich.....	210	No. 1.....	- 0.8284*	Do.
	Escanaba, Mich.....		No. 1.....		
201	Detour, Mich.....	72	Goetz.....	+ 3.4860*	Do.
	Mackinaw, Mich.....		No. 1.....		
202	Detour, Mich.....	260	Goetz.....	+ 5.8360*	Do.
	Sand Beach, Mich.....		E.....		

\* These values are the result of the Lake Survey adjustment of the figure Escanaba-Mackinaw-Detour-Sand Beach. The unadjusted values are:

195.....	+3.1790
200.....	-0.8230
201.....	+3.4860
202.....	+5.8372



No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		<i>km.</i>		<i>m.</i>	
203	Sand Beach, Mich.	48	E	- 9.0267	MS. furnished Mar. 2, 1903, by Ch. of Eng. from U. S. Lake Survey.
	Lexington, Mich.		No. 4		
204	Lexington, Mich.	185	No. 4	+ 2.8581	Do.
	Trenton, Mich.		1877		
205	Gibraltar, Mich.	7	1 (1877)	- 6.3912	Do.
	Trenton, Mich.		1877		
206	Trenton, Mich.	12	1877	+ 7.4113	Do.
	Amherstburg, Can.		Gage		
207	Amherstburg, Can.	418	Gage	- 3.3370	Do.
	Buffalo, N. Y.		L. H.		
208	Cleveland, Ohio.	288	No. 1	- 2.6478*	Do.
	Buffalo, N. Y.		L. H.		
209	Buffalo, N. Y.	80	L. H.	+100.8456	Do.
	Olcott, N. Y.		No. 4		
210	Olcott, N. Y.	180	No. 4	+ 2.2409	Do.
	Oswego, N. Y.		A		
211	Oswego, N. Y.	131	A	- 54.4108	Do.
	Utica, N. Y.		L. S. 92		
212	Utica, N. Y.	148	L. S. 92	+ 73.0104	Do.
	Vischers Ferry, N. Y.		L. S. 18		
213	Vischers Ferry, N. Y.	34	L. S. 18	+ 53.9514	Do.
	Greenbush, N. Y.		Gristmill		
214	Erie, Pa.	130	1 (1873)	- 4.4781†	Do.
	Buffalo, N. Y.		L. H.		
215	Buffalo, N. Y.	66	L. H.	- 2.6277	MS. furnished by U. S. Geol. Surv. Feb., 1903.
	Dunkirk, N. Y.		598 D		
216	Hornellsville, N. Y.	142	1141 D	+261.9448	Do.
	Charlotte, N. Y.		1 (1874)		
217	Charlotte, N. Y.	91	1 (1874)	+ 9.5418	MS. furnished by Ch. of Eng. Mar. 14, 1903.
	Oswego, N. Y.		A		
218	Sidney, N. Y.	99	Tel. Pole 991	+170.8679	MS. furnished Feb., 1903, by U. S. Geol. Surv.
	Utica, N. Y.	(61.4 ml.)	L. S. 92		
220	Irvineton, Pa.	62	1167 D	- 7.9602	Do.
	Lebosuf, Pa.	(39 ml.)	1193 P		
221	Franklin, Pa.	93	987 P	- 54.9415	Do.
	Irvineton, Pa.		1167 D		
222	Salamanca, N. Y.	78	1391 D	+ 68.1732‡	Do.
	Irvineton, Pa.		1167 D		
223	Elmira, N. Y.	121	857 A	+101.6296	Do.
	Williamsport, Pa.		P. R. R. 46		
224	Harrisburg, Pa.	150	P. R. R. 2	- 57.2873	Pa. R. R. B. M. Book, pp. 46, 110-113, 96-99.
	Williamsport, Pa.	(93 ml.)	P. R. R. 46		
225A	Hancock, Md.	89	F	+ 57.2077	MS. furnished by the B. and O. R. R.
	Washington Jct., Md.		B. & O. 44 A		
225B	Washington Jct., Md.	69	B. & O. 44 A	+ 43.4779	Do.
	Washington, D. C.		Capitol		
226	Cumberland, Md.	90	I	+ 61.9468	Do.
	Hancock, Md.	(56 ml.)	F		
227	Cumberland, Md.	35	I	-275.0180	Do.
	Foley, Pa.	(22 ml.)	B. & O. 176		
228	Sidney, N. Y.	71	Tel. Pole 991	+ 20.2617	MS. furnished Feb., 1903, by U. S. Geol. Surv.
	Hancock, N. Y.		924 A		
229	Hancock, N. Y.	222	924 A	+229.2567	Do.
	Poughkeepsie, N. Y.		173 A		
230	Binghamton, N. Y.	78	867 A	- 17.8884	Do.
	Hancock, N. Y.		924 A		
231	Fort Worth, Tex.	200	U	- 20.5443	C. and G. S. Rep. 1903, pp. 332-335.
	Temple, Tex.		L <sub>4</sub>		
232	Temple, Tex.	89	L <sub>4</sub>	-110.1793	Ibid., 1903, pp. 336-337.
	Lampasas, Tex.		NE. Base		
233A	Temple, Tex.	27	L <sub>4</sub>	+ 50.5745	Ibid., 1903, p. 338.
	Holland, Tex.		W <sub>4</sub>		
234	Rock Creek, Wyo.	212	U	- 4.2761	Ibid., 1903, pp. 340-345.
	Red Desert, Wyo.		B <sub>2</sub>		
235	Mackinaw, Mich.	290	No. 1	+ 2.3491§	MS. furnished Mar. 2, 1903, by Ch. of Eng. from U. S. Lake Survey.
	Sand Beach, Mich.		E		
236	Cleveland, Ohio.	155	No. 1	+ 1.8303	Do.
	Erie, Pa.		1 (1873)		
237	Red Desert, Wyo.	636	B <sub>2</sub>	+687.6632	C. and G. S. Rep. 1904, App. 6, pp. 408-410.
	Pocatello, Idaho.		B <sub>2</sub>		
238	Pocatello, Idaho.	358	B <sub>2</sub>	+456.3112	Ibid., 1904, App. 6, p. 412.
	Owyhee, Idaho.		W <sub>4</sub>		
239	Owyhee, Idaho.	937	W <sub>4</sub>	+903.5122	Ibid., 1905, App. 4, pp. 206-212.
	Seattle, Wash.		Sea level		

\* This value is the result of the Lake Survey adjustment of the circuit Cleveland-Buffalo-Erie-Cleveland. The unadjusted value is -2.6441.

† This value is the result of the Lake Survey adjustment of the circuit Cleveland-Buffalo-Erie-Cleveland. The unadjusted value is -4.4818.

‡ This line was run twice.

§ This is the adjusted value. See note on p. 55. The unadjusted value is +2.3424.

|| This is the adjusted value. The unadjusted value is +1.8294.

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		km.		m.	
240	St. Cloud, Minn.	141	P. B. M. St. Cloud....	- 99.6535	Pp. 20, 21 of this report.
241	Evansville, Minn.	314	T <sub>1</sub> .....	+161.0467	Pp. 33-35 of this report.
242	Evansville, Minn.	266	Stephen W. Base.....	-114.7609	Pp. 21, 22 of this report.
243	Watertown, S. Dak.	358	U.....	+194.2572	Pp. 25-27 of this report.
244	Holland, Tex.	116	P. B. M. 399.....	+ 54.0813	C. and G. S. Rep. 1904, App. 7, pp. 437, 438.
245	Smithville, Tex.	114	W <sub>1</sub> .....	- 92.5571	Ibid., 1904, App. 7, pp. 438, 439.
246	Smithville, Tex.	273	W <sub>1</sub> .....	+100.6431	Pp. 37, 38 of this report.
247*	Vidalia, La.	92	Sea level.....	- 1.0034	MS. furnished by Miss. River Com., Dec., 1906.
248†	Fort Adams, Miss.	147	XLIX.....	+ 6.9112	Do.
249	Vicksburg, Miss.	147	SW. Base.....	+ 6.9112	Do.
250	Acme, La.	35	XLIV.....	- 9.1469	Ch. of Eng. Rep., 1902, Pt. 2, pp. 1466-1467.
251	Barbin Landing, La.	56	T. B. M. 53.....	+ 5.2811	Ibid., 1902, Pt. 2, pp. 1463, 1464.
252	Archibald, La.	183	P. B. M. Archibald... 137	- 24.5491	Ibid., 1902, Pt. 2, pp. 1451-1453.
253	Camden, Ark.	35	P. B. M. Camden IV..	+ 5.8046	Ibid., 1902, Pt. 2, p. 1462.
254	Delhi, La.	29	P. B. M. 46.....	+ 1.8374	Ibid., 1902, Pt. 2, p. 1465.
255	Tensas River, La.	105	P. B. M. 13.....	+ 26.3900	Ibid., 1903, Supp., pp. 80-96; 1905, Supp., pp. 80, 85.
256	Gilbert, La.	48	P. B. M. Gray.....	+ 5.7282	MS. furnished by B. and O. R. R.
257	New Light, La.	96	P. B. M. Gilbert.....	+ 18.793 ft.)	Do.
258	Grand Rapids, Minn.	12	P. B. M. New Light.....	- 49.2281	Do.
259	Aiken, Minn.	6	T. B. M. 230.....	+ 14.1938	Do.
260	Washington, D. C.	117	Court-house.....	+ 46.567 ft.)	Pp. 28, 29 of this report.
261	Relay, Md.	117	Capitol.....	+ 7.6634	MS. furnished by B. and O. R. R.
262	Relay, Md.	96	B. & O. 31.....	-304.6561	MS. furnished by B. and O. R. R.
263	Washington Jct., Md.	12	B. & O. 31.....	(-999.526 ft.)	Do.
264	Relay, Md.	12	B. & O. 44 A.....	+191.3401	Do.
265	Baltimore, Md.	6	B. & O. 40.....	(+627.755 ft.)	Do.
266	Baltimore, Md.	6	B. & O. 40.....	+ 72.0615	Do.
267	Cumberland, Md.	103	Sea level.....	(+236.422 ft.)	MS. furnished by B. and O. R. R., Feb., 1904.
268	Amblerburg, W. Va.	48	I.....	- 65.0215	Do.
269	Amblerburg, W. Va.	127	L.....	(-213.3246 ft.)	Do.
270	Grafton, W. Va.	103	M.....	- 29.3801	Do.
271	Benson Ferry, W. Va.	74	885 Pittsburg.....	(-96.391 ft.)	Do.
272	Bowwood, W. Va.	51	94 A.....	- 48.9522	Do.
273	Uhrichsville, Ohio	28	B. & O. 48.....	(-160.604 ft.)	P. 40 of this report.
274	Uhrichsville, Ohio	12	B. & O. 48.....	+ 24.4871	MS. furnished by B. and O. R. R., Feb., 1904.
275	Warwick, Ohio	116†	B. & O. 449.....	+ 26.0051	Pp. 32, 33 of this report.
276	Warwick, Ohio	113	B. & O. 481.....	(+ 85.318 ft.)	MS. furnished by U. S. Geol. Surv.
277	Sullivan, Ohio	104	B. & O. 495.....	+ 73.3311	Do.
278	Greenwich, Ohio	15	B. & O. 503.....	- 16.0990	Do.
279	Greenwich, Ohio	65	B. & O. 503.....	(- 52.818 ft.)	Do.
280	Chicago Jct., Ohio	80	R.....	+ 34.7265	Do.
281	Deshler, Ohio	122	T.....	+ 31.3551	Do.
282	Uhrichsville, Ohio	171	U. S. E. 1.....	(+102.871 ft.)	Leveling of U. S. Eng. submitted by U. S. Geol. Surv.
283	Zanesville, Ohio	104	U. S. E. 1.....	- 32.8743	MS. furnished by B. and O. R. R.
284	Valley Crossing, Ohio	208	B. & O. 176.....	(-107.855 ft.)	Do.
285	Valley Crossing, Ohio	71	818 Pittsburg.....	+215.8208	Do.
286	Columbus, Ohio	39	B. & O. 349.....	(+708.072 ft.)	Do.
287	Valley Crossing, Ohio	26	B. & O. 376.....	- 22.0540	Do.
288	Chillicothe, Ohio	69	B. & O. 349.....	(- 72.356 ft.)	Do.
289	Chillicothe, Ohio	69	B. & O. 376.....	+ 13.9604	Do.
290	Portsmouth, Ohio	25	B. & O. 349.....	(+ 45.8020 ft.)	P. 41 of this report.
291	Marietta, Ohio	69	25 A.....	+ 41.6606	P. 42 of this report.
292	Zanesville, Ohio	69	B. & O. 376.....	- 76.5850	P. 42 of this report.
293	Foley, Pa.	69	Br. 66.....		
294	Beaumont, Pa.				
295	Beaumont, Pa.				
296	Ellwood City, Pa.				
297	Ellwood City, Pa.				
298	Struthers, Ohio				
299	Ellwood City, Pa.				
300	Monaca, Pa.				
301	Struthers, Ohio				
302	Alliance, Ohio				

\* This line supersedes line 148.

† This line supersedes line 42.

‡ This line was assigned a weight of  $\frac{1}{4}$  times a regular line of the same length on account of the rerunning which amounts to more than an additional single running.

No.	Places.	Distance.	Bench marks.	Difference of elevation.	Reference.
		<i>km.</i>		<i>m.</i>	
281	Warwick, Ohio.....	25	B. & O. 449.....	- 1.6721	MS. furnished by B. and O. R. R.
	East Akron Jct., Ohio.....		Wall.....	(- 5.4860 ft.)	
282	Pekin, Ill.....	251	P. B. M. 49.....	+ 8.5321	House Doc. 263, 59th Cong., 1st sess., pp. 94-126.
	Grafton, Ill.....		P. B. M. 2.....		Ibid., pp. 126-169.
283	Chicago, Ill.....	287	P. B. M. 99.....	+ 41.5467	
	Pekin, Ill.....		P. B. M. 49.....		
284	Pekin, Ill.....	138	P. B. M. 49.....	- 80.9611	MS. furnished by U. S. Geol. Surv.
	Champaign, Ill.....		F <sub>1</sub> .....		
285	Champaign, Ill.....	216	F <sub>1</sub> .....	+ 71.6214	Do.
	Olney, Ill.....	(135 mi.)	B <sub>3</sub> .....	(+234.978 ft.)	

The statements of the local relative elevations which were held fixed in the adjustments of 1899 and 1903 are here repeated in abbreviated form for convenience of reference, together with new matter of the same kind. The complete statements may be found on the pages of Appendix 8, Report for 1899, and Appendix 3, Report for 1903, referred to in the separate paragraphs.

#### No. 1.—VICINITY OF NEW YORK CITY.

The differences of elevation which are fixed, see pages 402-404 of Appendix 8, Report for 1899, are—

Raritan Bay, F—Sea level at Sandy Hook = +2<sup>m</sup>.3640; distance 55 kilometers.

Dobbs Ferry, V—Sea level at Sandy Hook = +2<sup>m</sup>.9357; distance 144 kilometers.

The elevations of six bench marks at Fort Hamilton, A to H, published on page 580 of Appendix 3, Report for 1903, depend only on tide observations at Fort Hamilton and are not connected with the precise level net.

#### 6A.—CINCINNATI, OHIO, TO LAWRENCEBURG, IND., AND COVINGTON, KY.

The differences of elevation fixed as indicated on page 360 of Appendix 3, Report for 1903, are—

Cincinnati, T—Lawrenceburg, U = +18<sup>m</sup>.4695; distance 37 kilometers.

Cincinnati, T—Cincinnati, O<sub>4</sub> = +16<sup>m</sup>.7277.

Cincinnati, T—Covington, A<sub>3</sub> = +4<sup>m</sup>.0849.

Cincinnati, T—Ludlow, C = +4<sup>m</sup>.4507; distance 8 kilometers.

#### No. 10.—JEFFERSON CITY, MO.

The differences of elevation fixed as indicated on page 405 of Appendix 8, Report for 1899, are—

90 (85)—XXVII = -14<sup>m</sup>.8684; distance 0.5 kilometer.

XXVII—XXVIII = -6<sup>m</sup>.8101; distance 0.2 kilometer.

#### No. 12.—PLEASANT HILL, MO.

The difference of elevation fixed as indicated on page 405 of Appendix 8, Report for 1899, is LI—LII = +1<sup>m</sup>.2130; distance 1.2 kilometers.

#### No. 14.—KANSAS CITY, MO.

The difference of elevation fixed as indicated on page 405 of Appendix 8, Report for 1899, is LVIII—P. B. M. 244 = -1<sup>m</sup>.9810; distance 8.3 kilometers.

## No. 15B.—HOLLIDAY, KANS.

The difference of elevation fixed as indicated on page 361 of Appendix 3, Report for 1903, is  $LXIII - LXII = +0^m.0206$ .

## No. 17A.—ABILENE, SOLOMON, AND SALINA, KANS.

The differences of elevation fixed as indicated in Appendix 8, Report for 1899, on pages 405-406, and on page 361 of Appendix 3, Report for 1903, are—

Abilene,  $B_1$ —Solomon,  $C_1 = -5^m.6278$ ; distance 14 kilometers.

Abilene,  $B_1$ —Abilene,  $Y_1 = +2^m.2729$ ; distance 2 kilometers.

Solomon,  $C_1$ —Salina,  $H_1 = -15^m.3095$ ; distance 23 kilometers.

## No. 21.—ELLIS, KANS.

The difference of elevation fixed as indicated on page 406 of Appendix 8, Report for 1899, is  $A_2 - B_2 = +0^m.1163$ .

## No. 24.—LIMON, COLO.

The difference of elevation fixed as indicated on page 406 of Appendix 8, Report for 1899, is  $N - P = -6^m.9860$ .

## No. 27.—DENVER, COLO.

The differences of elevation fixed as indicated on page 406 of Appendix 8, Report for 1899, are  $Z_1 - B_1 = +0^m.6844$  and  $B_2 - A_2 = +0^m.0360$ .

## No. 29A.—BILOXI, MISS.

The difference of elevation fixed as indicated on page 361 of Appendix 3, Report for 1903, is  $E_1$ —Sea level at Biloxi  $= +4^m.7915$ .

## No. 33.—CORINTH, MISS.

The difference of elevation fixed as indicated on pages 407-408 of Appendix 8, Report for 1899, is  $W - V = +0^m.0569$ .

## No. 35.—CAIRO, ILL.

The difference of elevation fixed as indicated on page 408 of Appendix 8, Report for 1899, is P. B. M. 2—P. B. M. 1  $= +0^m.4031$ .

## No. 41.—VIDALIA, LA.

The difference of elevation fixed as indicated on page 408 of Appendix 8, Report for 1899, is Palo Alto,  $LXIV$ —Vidalia,  $LXI = +0^m.9880$ ; distance 5.8 kilometers.

## No. 43.—VICKSBURG, MISS.

SW. Base, NE. Base, P. B. M. B, and M. R. C. <sup>1905</sup> were connected by the Mississippi River Commission in 1905. The discrepancies between the elevations as determined from the earlier leveling and as determined in 1905 are too large to be due to errors of leveling. Therefore the values involving these bench marks, given in the statement of local relation, on page 409 of Appendix 8, Report for 1899, are no longer adopted. The elevations as given by the 1905 line are adopted.

The following differences of elevations, fixed as indicated on pages 408-409 of Appendix 8, Report for 1899, remain unchanged—

Delta, 211 - Delta, 215 =  $-0^m.1143$ ; distance 3.6 kilometers.

Delta, 211 - Vicksburg, Cistern =  $-31^m.1994$ ; distance 12 kilometers.

Delta, 211 - Delta, SW. Base =  $+1^m.1314$ ; distance 2.6 kilometers.

Delta, 211 - Vicksburg, P. B. M. 2 =  $-1^m.6679$ ; distance 15 kilometers.

No. 45.—WILKERSONS LANDING, MISS.—ARKANSAS CITY, ARK.

The difference of elevation fixed as indicated on page 410 of Appendix 8, Report for 1899, is Arkansas City, F - Wilkersons Landing, 84 =  $-0^m.0564$ ; distance 2 kilometers.

No. 49.—VAN BUREN, ARK.

The difference of elevation fixed as indicated on page 410 of Appendix 8, Report for 1899, is XXXIX - XXXVIII =  $-0^m.0072$ .

No. 52.—CHESTER, ARK.

The difference of elevation fixed as indicated on page 410 of Appendix 8, Report for 1899, is XLIX - XLVIII =  $-1^m.1358$ .

No. 54.—BOSTON, MO.

The difference of elevation fixed as indicated on page 410 of Appendix 8, Report for 1899, is XCVI - XCVII =  $-0^m.0008$ .

No. 58.—WASHINGTON, D. C.

The new determination of mean sea level at Baltimore, Md. (see page 28), and the leveling of the Baltimore and Ohio Railroad from Baltimore to Washington, give a new determination of elevations in Washington. This determination is believed to be of a higher degree of accuracy than that depending on observations of the water surface of the Potomac River and the assumption of the fall of the Potomac from Washington to the sea, shown on pages 362-363 of Appendix 3, Report for 1903. The connection with mean sea level at Washington was therefore not used in the level net, and the elevation of Washington was determined as a junction point of the lines to Baltimore, Hancock, and Hagerstown. However, the elevation for the Capitol bench mark obtained thus from the adjustment of the level net was 27.6033 meters, differing but 37.6 millimeters from the 1903 value and, as stated later in this publication, under the heading "Adopted elevations of junction points," the 1903 elevations of this and all other bench marks in Washington as published in Appendix 3, Report for 1903, were not changed.

No. 60.—RICHMOND, VA.

The elevation of O fixed as indicated on page 411 of Appendix 8, Report for 1899, is O - Sea level =  $+58^m.1957$ .

No. 62.—OLD POINT COMFORT, VA.

The elevation of U fixed as indicated on page 411 of Appendix 8, Report for 1899, is U - Sea level =  $+2^m.6875$ .

## No. 67.—ANNAPOLIS, MD.

The elevation of the Perkins B. M. fixed as indicated on page 411 of Appendix 8, Report for 1899, is a, or Perkins Tidal B. M.,—Sea level =  $+1^m.268$ .

## No. 71.—GIBRALTAR, MICH.

The difference of elevation fixed as indicated on page 411 of Appendix 8, Report for 1899, is 1 (of 1898) — (1877) =  $+1^m.5488$ .

## No. 74B.—SHREVEPORT, LA.—BODCAU, LA.

The difference of elevation fixed as indicated on page 363 of Appendix 3, Report for 1903, is Bodcau, P. B. M. 44—Shreveport, P. B. M. 46 =  $+2.4335$ ; distance, 15 kilometers.

## No. 75.—MONROE, LA.

The difference of elevation fixed as indicated on page 411 of Appendix 8, Report for 1899, is P. B. M. 24—P. B. M. 27 =  $-1^m.9772$ .

## No. 77.—RAYVILLE, LA.

The difference of elevation fixed as indicated on page 412 of Appendix 8, Report for 1899, is P. B. M. 17—P. B. M. 16 =  $+2^m.3294$ .

## No. 82.—JONESVILLE, LA.

In the publication of the lines from Vidalia to Jonesville and from Jonesville to Concordia (see Report of the Chief of Engineers, U. S. Army, for 1902, Part II, pages 1451 and 1466) the determination of P. B. M. 5 in 1894 differs from that given in manuscript in the Vicksburg tabulation (see page 414 of Appendix 8, Report for 1899). As now published, there are no discrepancies between the various determinations. In the report referred to, junction is made on P. B. M. 4, and therefore that bench mark is made the junction point in this adjustment.

## No. 85.—PARKEVILLE, LA.

The difference of elevation fixed as indicated on page 412 of Appendix 8, Report for 1899, is T. B. M. 74—Parkeville =  $+1^m.2220$ .

## No. 95.—AUSTIN, MISS.

The fixed relation between the bench marks is shown on page 412 of Appendix 8, Report for 1899.

## No. 107.—GRAFTON, ILL.

P. B. M. 3, which was considered the most stable of the bench marks at Grafton (see page 412 of Appendix 8, Report for 1899), was moved and reset in 1901. P. B. M. 2 was adopted as the junction point in 1907, and a mean value of the difference between P. B. M. 2 and P. B. M. 3, in its old position, was determined as follows: P. B. M. 3—P. B. M. 2, from the line Grafton to Cairo =  $+2.9471$  meters; from the line Keokuk to Grafton =  $+2.9496$  meters. The mean is  $+2.9484$  meters and is adopted. (See the Report of the Chief of Engineers, U. S. Army, for 1884, Part 4, pages 2476, 2512.)

Nos. 109, 111, 114.—KEOKUK, IOWA; SAVANNA, ILL.; ST. PAUL, MINN.

The fixed relations between bench marks at the above-named points are shown on page 413 of Appendix 8, Report for 1899.

No. 123.—ST. JOSEPH, MO.

The difference of elevation fixed as indicated on page 413 of Appendix 8, Report for 1899, is P. B. M. 287—P. B. M. 290 =  $-0^m.9892$ .

No. 133 B.—TROY, N. Y.

The difference of elevation of two bench marks in Troy, as determined by the Board of Engineers on Deep Waterways, is adopted as fixed, namely, D. W. Troy 2—D. W. Troy 1 (or N. Y. 12) =  $+0^m.7925 = +2.60$  feet.

No. 140 A.—ERIE, PA.

According to information furnished by the engineer in charge at Erie, B. M. 1 (1873) is 2.200 feet lower than the United States Engineers' bench mark on the light-house; hence, L. H. -1 (1873) =  $+0^m.6706$ .

No. 141 A.—PITTSBURG, PA.

The following differences of elevation, as determined by the United States Geological Survey lines from Erie to Pittsburg and Grafton to Pittsburg, are adopted as fixed:

Braddock, P. R. R. 88—Pittsburg, Penn avenue curb =  $+28^m.0770$ ; distance, 7.6 kilometers.

West Penn Junction, P. R. R. 26—Pittsburg, Penn avenue curb =  $+15^m.8292$ ; distance, 27.3 kilometers.

Pittsburg, P. R. R. 99—Pittsburg, Penn avenue curb =  $+2^m.1766$ ; distance, 1.4 kilometers.

And from the P. R. R. bench mark book is adopted as fixed: P. R. R. 99—P. R. R. 100 =  $-0^m.0518$ .

The following difference of elevation, as determined by the United States Geological Survey, on the line Grafton to Pittsburg, is considered fixed: Benvenue, 818 Pittsburg—Pittsburg, Penn avenue curb =  $+81.563$  feet = 24.8605 meters; distance, 1.5 kilometers.

This, with the other fixed differences of elevation above, gives: Benvenue, 818 Pittsburg—P. R. R. 99 =  $+22.6839$  meters.

No. 143 D.—HARRISBURG, PA.

The differences of elevation fixed as indicated on page 364 of Appendix 3, Report for 1903, are:

P. R. R. 1—XXIX =  $-11.2227$  meters.

P. R. R. 2—P. R. R. 1 =  $+5.2160$  meters.

No. 149.—BIRMINGHAM, ALA.

The following difference of elevation, as determined by the Corps of Engineers, U. S. Army, on line from York to Birmingham, is considered fixed: P. B. M. 1—P. B. M. 2 =  $+4^m.5173$ .

## No. 154.—SIOUX CITY, IOWA.

The difference of elevation fixed as indicated on page 365 of Appendix 3, Report for 1903, is P. B. M. 399—B<sub>2</sub> = -1.0821 meters, distance, 16 kilometers. Using the new leveling of 1904, Watertown to Sioux City, gives a value differing only 8.6 mm. from the above value, which is therefore not changed. See page 24.

## No. 156.—NORFOLK, NEBR.

The differences of elevation fixed as indicated on page 365 of Appendix 3, Report for 1903, are—

$$T. B. M. 2 - N_1 = -0.8132 \text{ meter.}$$

$$O_1 - N_1 = +1.1565 \text{ meters.}$$

## No. 158.—HARRIMAN JUNCTION, TENN.

The difference of elevation fixed as indicated on page 365 of Appendix 3, Report for 1903, is A<sub>2</sub>—C<sub>2</sub> = -7.1484 meters.

## No. 161.—MOREHEAD CITY, N. C.

The difference of elevation fixed as indicated on page 365 of Appendix 3, Report for 1903, is 7 M C—Sea Level = +2.1186 meters. Six months' record in 1898 with self-registering tide gauge gave an elevation for 7 M C of 6.929 feet. As this differed but 0.02 foot from the value used in 1903, the above difference of elevation is not changed.

## No. 163.—KNOXVILLE, TENN.

The differences of elevation fixed as indicated on page 366 of Appendix 3, Report for 1903, are—

Caswell, 867 M C—Knoxville, 933 M C = -20.0834 meters; distance, about 10 kilometers.

Knoxville, 933 M C—Wright, 940 M C = -2.1626 meters; distance, about 10 kilometers.

## No. 165.—BRUNSWICK, GA.

The difference of elevation fixed as indicated on page 366 of Appendix 3, Report for 1903, is 10 M C—Sea Level = +3.2577 meters.

## No. 169E.—BELPRE TO MARIETTA, OHIO.

The following difference of elevation, determined by the Corps of Engineers, U. S. Army, and transmitted to this office by the U. S. Geological Survey, is considered fixed; Belpre, XL—Marietta, 171 B = +29.722 feet = +9.0593 meters; distance, 13 miles, or 21 kilometers.

## No. 179.—ANTHONY, KANS.

The difference of elevation fixed as indicated on page 366 of Appendix 3, Report for 1903, is Anthony SE. base—F<sub>2</sub> = +9.8326 meters; distance, approximately, 3 kilometers.

## No. 183.—CLEVELAND, OHIO.

The difference of elevation fixed as indicated on page 366 of Appendix 3, Report for 1903, is U. S. E. 2—U. S. E. 1 = -1.1186 meters.



## No. 219.—BAINBRIDGE AND SIDNEY, N. Y.

The difference of elevation fixed as indicated on page 366 of Appendix 3, Report for 1903, is Bainbridge, 989 A—Sidney, Tel. Pole 991 = -0.4401 meter; distance, 2 kilometers.

## No. 261.—GRAFTON, VALLEY FALLS, AND BENTON FERRY, W. VA.

Bench marks at Grafton and Valley Falls were connected by the United States Geological Survey on the line Grafton to Pittsburg, and by the Baltimore and Ohio Railroad on the line Cumberland to Benwood, with the following results:

Grafton, M—Valley Falls, 986 Pittsburg = +11.251 feet by U. S. G. S.

Grafton, M—Valley Falls, 986 Pittsburg = +11.2596 feet by B. & O. R. R.

Mean adopted, +11.2553 feet = 3.4306 meters; distance, 4.8 miles = 8 kilometers.

The difference between bench marks at Grafton and Benton Ferry was also determined as follows:

Grafton, M—Benton Ferry, 885 Pittsburg = +111.748 feet by U. S. G. S.

Grafton, M—Benton Ferry, 885 Pittsburg = +111.7658 feet by B. & O. R. R.

Mean adopted, +111.7569 feet = +34.0636 meters; distance, 17.4 miles = 28 kilometers.

## No. 279.—MONACA, PA.

The following difference of elevation, determined by the Corps of Engineers, U. S. Army, and transmitted to this office by the United States Geological Survey, is considered fixed: Monaca, 25 A—Monaca, 25 C = +67.291 feet = +20.5103 meters.

## No. 286.—CHICAGO, ILL.

Five bench marks in Chicago, determined on the line Savanna to Chicago in 1883, were redetermined in 1904 on the line Grafton to Chicago. The following are the observed elevations from each line, all referred to P. B. M. 99 as 180.3077 meters:

Bench mark.	1883.	1904.	1904-1883.
	<i>meters.</i>	<i>meters.</i>	<i>mm.</i>
P. B. M. 99.....	180.3077	180.3077	0.0
VII.....	181.5620	181.5405	-21.5
P. B. M. 96.....	182.3783	182.3750	-3.3
VI.....	181.4351	181.4441	+9.0
P. B. M. 98.....	182.4300	182.4168	-13.2
Mean.....			-5.8

This indicates that P. B. M. 99 and P. B. M. 96 are stable and that the other bench marks have changed in elevation in the interval. It was reported in 1904 that B. M. VII had been damaged. P. B. M. 99 was retained as the junction point between these lines and the water leveling on Lake Michigan. New elevations from the 1904 line are given for the other bench marks.

## THE CIRCUIT CLOSURES.

The leveling shown in the preceding table and paragraphs forms a large number of circuits, which are clearly shown on the sketch opposite page 51. The

closing error in millimeters and circumference in kilometers are printed inside each circuit. These circuits are also given below in a table for convenient reference, arranged in the order of the magnitude of the closures expressed in millimeters per kilometers, the best closure being placed first. Only simple circuits are used, i. e., there is no circuit given in the table, or the closure shown on the sketches, which is divided by cross lines into smaller circuits.

For all circuits of which the Atlantic, the Pacific, or the Gulf of Mexico forms one side, it is assumed that the mean sea surface is everywhere the same level on the Atlantic, the Pacific, and the Gulf of Mexico, and the circumferences of such circuits do not include tide-water distances.

A plus sign on the closing error indicates that the elevation as carried around the circuit in a clockwise direction is too great.

The last column shows the character of the lines forming the circuits, the different grades of lines being mentioned in decreasing order of the number of kilometers entering into the circuit. The symbols 1899 - and 1899 + in the last column refer, respectively, to leveling by Coast and Geodetic Survey previous to 1899, and leveling by the Coast and Geodetic Survey in 1899 and later. The leveling referred to by "Eng." was done under the direction of the Corps of Engineers, U. S. Army, the Mississippi River Commission, or the Missouri River Commission, with Kern instruments. The abbreviation "G. S. 1905 +" refers to leveling done by the United States Geological Survey in 1905 and 1906 with instruments and methods similar to those used by the Coast and Geodetic Survey in 1899 and later; "Geol." refers to leveling done by the United States Geological Survey previous to 1905; "Lake" refers to leveling done by the United States Lake Survey, and "Water" to water leveling on the lakes.

*Closing errors of circuits.*

[The circumferences given for circuits of which tide water forms one side do not include tide-water distance.]

Serial No.	Circuit.	Circuit closure.	Circumference of circuit.	Circuit closure per kilometer.	Character of lines.
		<i>mm.</i>	<i>km.</i>	<i>mm.</i>	
1	Galveston - Salina - Limon - Colorado Springs - Denver - Cheyenne - Seattle.	+ 1.6	4 087	+0.0003	1899+, 1899-.
2	Boston - Greenbush - Coopersville - Oswego - Buffalo - Trenton - Sand Beach - Detour - Duluth - St. Paul - Sioux City - Cheyenne - Seattle.	- 26.2	7 579	- .003	1899+, Water, Lake, Eng., Eng. Wye., Van O.
3	Cincinnati - Chillicothe - Uhrichsville - Warwick - Deshler - Cincinnati.	- 8.2	993	- .008	1899+, G. S. 1905+, 1899-, B. & O.
4	Belpre - Chillicothe - Portsmouth - Belpre.	- 4.8	510	- .009	Eng. Wye., 1899-, G. S. 1905+.
5	Savanna - Sand Beach - Escanaba - Marquette - Savanna.	- 34.7	2 877	- .012	Water, Eng., Lake.
6	Sand Beach - Mackinaw - Escanaba - Sand Beach.	- 13.6	1 000	- .014	Water.
7	Sand Beach - Detour - Mackinaw - Sand Beach.	+ 8.8	622	+ .014	Water.
8	Cleveland - Erie - Buffalo - Cleveland.	+ 8.3	573	+ .014	Water.
9	Zanesville - Valley Crossing - Chillicothe - Belpre - Marietta - Zanesville.	+ 9.5	470	+ .020	G. S. 1905+, 1899-, Eng. Wye.
10	Oswego - Greenbush - Coopersville - Oswego.	+ 20.4	985	+ .021	Lake, Eng. Wye., Water.
11	Concordia - Archibald - Columbia - Jonesville - Concordia.	+ 8.9	258	+ .034	Eng.
12	Utica - Bainbridge - Viscers Ferry - Utica.	+ 16.2	417	+ .039	Geol., Lake.
13	Decatur - Tusculum - Decatur.	+ 6.5	158	+ .041	Eng., 1899+.
14	Hancock - Bainbridge - Binghamton - Hancock.	- 10.5	211	- .050	Geol.
15	Biloxi - Smithland - Shreveport - Fort Worth - Galveston.	- 96.7	1 791	- .054	1899+, Eng.
16	Chicago - Savanna - Grafton - Chicago.	+ 71.6	1 303	+ .055	Eng.
17	Cincinnati - Lexington - Sand Beach - Chicago - Pekin - Oney - Cincinnati.	- 138.0	2 493	- .055	Water, 1899+, G. S. 1905+, 1899-, Eng., Lake.
18	Vicksburg - Rayville - Concordia - Vidalia - Vicksburg.	- 19.3	347	- .056	Eng.
19	Cleveland - E. Akron Jct. - Warwick - Benwood - Monaca - Alliance - Struthers - Pittsburg - Erie - Cleveland.	- 63.9	1 102	- .058	Geol., B. & O., Water, Eng. Wye., P. R. R., 1899+.

## Closing errors of circuits—Continued.

Serial No.	Circuit.	Circuit closure.	Circumference of circuit.	Circuit closure per kilometer.	Character of lines.
		mm.	km.	mm.	
20	Harrisburg - Elmira - Salamanca - Franklin - Pittsburg - Harrisburg.*	72.4	1 227	-0.059	Geol., P. R. R.
21	Abilene-Norfolk-Orin Junction-Denver-Abilene.....	170.3	2 446	-0.070	1899+, 1899-.
22	Monroe-Camden-Shreveport-Monroe.....	40.5	526	-0.077	Eng.
23	Smithland - Vidalia - Jonesville-Barbin Landing-Smithland.	27.2	312	+0.087	Eng.
24	Boston-Greenbush-Dobbs Ferry-Sandy Hook.....	64.4	667	+0.097	Varr O., 1899+, 1899-.
25	Vicksburg-Wilkersons Landing-Monroe-Vicksburg.....	52.4	531	-0.099	Eng., 1899-.
26	Kansas City-Sioux City-Norfolk-Abilene-Kansas City..	133.6	1 325	-0.10	1899+, Eng., 1899-.
27	Washington-Relay-Washington Junction-Washington..	22.0	213	+0.10	B. & O.
28	Cleveland - Buffalo - Amherstburg - Trenton - Deshler - Warwick-Cleveland.	123.7	1 141	+0.11	Water, 1899+, B. & O., Geol. Eng. Wye, Lake.
29	Brainerd-Aitkin-Grand Rapids-Cass Lake-Brainerd....	45.5	400	-0.11	Eng.
30	Savanna - St. Paul - St. Cloud - Sioux City - Kansas City-Grafton-Savanna.	341.4	2 981	-0.11	Eng., 1899+.
31	Cincinnati-Portsmouth-Chillicothe-Cincinnati.....	57.6	497	-0.12	Eng. Wye, 1899-, G. S. 1905+.
32	Escanaba-Mackinaw-Detour-Iroquois-Marquette-Escanaba.	89.3	753	-0.12	Water, Lake.
33	Parkeville-Wilkersons Landing-Little Rock-Camden-Parkeville.	86.6	684	-0.13	Eng., 1899-.
34	Monroe-Shreveport-Barbin Landing-Jonesville-Monroe..	96.6	698	+0.14	Eng.
35	Grafton-Benwood-Belpre-Grafton.....	66.2	470	+0.14	1899-, B. & O., Eng. Wye
36	Utica-Oswego-Charlotte-Hornellsville-Bainbridge-Utica.	110.5	711	+0.16	Geol., Lake, Water.
37	Harrisburg - Pittsburg* - Cumberland-Hancock-Hagerstown-Harrisburg.	150.6	908	+0.17	P. R. R., B. & O., 1899-.
38	Raritan Bay-Poughkeepsie-Hancock-Binghamton-Elmira-Harrisburg-Raritan Bay.	185.3	1 108	+0.17	Geol., 1899-, P. R. R., 1899+
39	Biloxi-Meridian-Vicksburg-Smithland-Biloxi.....	204.2	1 191	+0.17	Eng., 1899-.
40	Pittsburg-Monaca-Benwood-Benton Ferry-Pittsburg....	86.0	488	-0.18	Geol., Eng. Wye, B. & O.
41	Brunswick-Cleveland-Chattanooga-Decatur-Meridian-Biloxi.	301.8	1 617	+0.19	Geol., 1899+, 1899-, Eng.
42	Morehead City-Knoxville-Cleveland-Brunswick.....	324.0	1 674	-0.19	Geol., 1899+.
43	Knoxville-Harriman Junction-Chattanooga-Cleveland-Knoxville.	78.8	389	+0.20	1899+, Geol.
44	St. Louis-Harrisonville-Little Rock-Wilkersons Landing-St. Louis.	457.6	2 219	-0.21	1899-, Eng.
45	Cumberland-Pittsburg-Grafton-Cumberland.....	133.8	646	-0.21	B. & O., Geol., 1899-.
46	Kansas City-Pleasant Hill-Jefferson City-Kansas City..	120.9	549	+0.22	Eng., 1899-.
47	Old Point Comfort-Washington-Grafton-Belpre-Cincinnati-Harriman Junction-Morehead City.	628.7	2 821	-0.22	Geol., 1899+, 1899-, B. & O. Eng. Wye.
48	Monroe-Columbia-Archibald-Rayville-Monroe.....	40.7	168	+0.24	Eng.
49	Oswego-Olcott-Dunkirk-Hornellsville-Charlotte-Oswego	186.8	766	-0.24	Geol., Water, Lake.
50	Pittsburg-Elwood City-Monaca-Pittsburg.....	34.2	139	+0.25	B. & O., Eng. Wye, 1899 Geol.
51	Baltimore-Relay-Washington-Annapolis.....	32.6	129	-0.25	1899-, B. & O., 1899+
52	Vicksburg-Greenwood-Greenville-Vicksburg.....	130.6	472	+0.28	Eng., 1899-.
53	Irvinton-Leboeuf-Franklin-Irvinton.....	70.7	241	+0.29	Geol.
54	Corinth-Cairo-Memphis-Corinth.....	237.0	746	-0.32	1899-, Eng.
55	Shreveport-Camden-Little Rock-Abilene-Fort Worth-Shreveport.	844.2	2 586	+0.33	1899+, 1899-, Eng.
56	Greenbush-Bainbridge-Hancock-Poughkeepsie-Greenbush.	207.7	613	+0.34	Geol., 1899+, Lake.
57	Cairo-Odin-St. Louis-Cairo.....	227.2	573	-0.40	1899-, Eng.
58	St. Louis-Olney-Pekin-St. Louis.....	380.6	862	-0.44	G. S. 1905+, Eng., 1899-.
59	Sandy Hook-Harrisburg-Hagerstown-Washington-Baltimore.	304.5	644	+0.47	1899-, B. & O., 1899+.
60	Decatur-Corinth-Meridian-Birmingham-Decatur.....	427.2	860	+0.50	1899-, 1899+, Eng.
61	Monaca-Elwood City-Struthers-Alliance-Monaca.....	148.3	228	-0.65	P. R. R., 1899+, B. & O.
62	Irvinton-Salamanca-Dunkirk-Buffalo-Erie-Leboeuf-Irvinton.	292.7	448	+0.65	Geol., Water.
63	Cincinnati-Odin-Corinth-Decatur-Harriman Junction-Cincinnati.	202.5	1 826	+0.66	1899-, 1899+, Eng.
64	Uhrichsville-Zanesville-Marietta-Benwood-Uhrichsville.	315.0	462	-0.68	Eng. Wye, G. S. 1905+, B. & O.
65	Meridian-Corinth-Memphis-Greenville-Greenville-Vicksburg-Meridian.	900.3	1 284	-0.70	1899-, Eng.
66	Cumberland-Hancock-Cumberland.....	136.6	184	+0.74	1899-, B. & O.
67	Limon-Denver-Colorado Springs-Limon.....	292.1	385	+0.76	1899-.
68	Washington-Hagerstown-Hancock-Washington.....	280.4	345	-0.81	1899-, B. & O.
69	Annapolis-Washington-Old Point Comfort.....	378.5	386	+0.96	1899-.
70	Cumberland-Amblersburg-Cumberland.....	253.3	233	+1.09	B. & O., 1899-.
71	Pleasant Hill - Kansas City - Holliday - Harrisonville - Pleasant Hill.	183.1	165	-1.11	1899-.
72	Cedar Keys-St. Augustine†.....	258.5	216	+1.20	1899-, Van O.
73	Grafton-Amblersburg-Grafton.....	189.6	96	+1.98	1899-, B. & O.

\* Between Pittsburg and Blairsville Intersection the mean of two determinations, via Braddock and via West Penn Junction, was used.

† The tidal series at each end of this line extends over one year only, and at each end the local conditions are such that the tide observations may be subject to considerable wind effect. (See App. 8, Rep. for 1899, p. 396.)

## THE LEVEL NET ADJUSTMENT OF 1907.

It is evident that in the closing errors of the circuits formed by the leveling there is information of the highest value as to the actual errors of the leveling. The concrete problem in hand is to adjust this level net by distributing the closing errors in such a way as to obtain as close an approximation as possible to the truth. The various lines composing the level net are shown on the sketch opposite page 51.

The line St. Augustine-Cedar Keys, across Florida, does not enter the equations of the adjustment, as it does not connect with any other line. The lines Old Point Comfort-Richmond-Washington and Annapolis-Washington were not used in the equations, but were adjusted between sea level at one end and the adopted elevation of Washington at the other.

The net is connected strongly with mean sea level at Sandy Hook, N. Y.; Biloxi, Miss.; Galveston, Tex.; and Seattle, Wash. At Baltimore, Md., the connection is not so strong and the connections at Morehead City, N. C., and Brunswick, Ga., are comparatively weak.

The adjustment of 1907 involves 148 links and 71 circuits. The adjustment of 1903 involved 106 links and 48 circuits, and that of 1899, 54 links and 25 circuits. This indicates that the net of 1907 is much stronger than either of the preceding adjustments.

The adjustment was made by the same methods as that of 1903. The 148 links, or equations, of observed differences of elevation between two points, known as junction points, or between mean sea level and one such point, are shown as observation equations in a table on pages 68-70. For equations which are unchanged from the adjustment of 1903 the previous numbering has been retained. The lines shown on pages 51-64, which are used in making up each equation, are indicated in the following table:

Link or equation.	References.	Link or equation.	References.	Link or equation.	References.
1A	29A, 144, 145, 146.	21	56.	36I	157A.
4B	147, 247.	22A	15A, 15B.	36J	189.
5B	74A, 74B.	22B	57A, 15B.	37C	168.
5C	74D.	22E	70A.	37E	169A.
5D	74E.	22F	16, 17A.	38B	118.
6A	80A.	22H	23, 22, 21, 20, 17A.	39A	195.
6B	80B.	22I	27, 28.	39C	196, 197.
6C	80C, 79.	22J	27, 26, 25, 24.	39D	112.
6D	83A, 249.	23	14, 13, 12.	40A	198, 199.
7A	77, 81A.	24	10, 11.	40B	200, 201.
7B	81B, 79.	25	14, 121.	40C	202.
7C	250.	26	9.	40D	203, 204.
8A	248.	27	105, 120, 10.	41A	206, 207.
9	89, 85, 86, 75.	28	103.	42A	209, 210.
10	77, 76, 75.	29	33, 66.	43A	138A, 215.
11A	78.	30	35, 34, 33.	43B	138B.
12A	90, 91, 44, 43.	31	104, 35.	43C	217, 216.
13A	90, 91, 92, 43.	32	36.	43D	138C.
14A	65, 43.	33A	110, 108, 106B, 107.	43E	138D, 138E.
15	29A, 30, 31.	33B	107, 106A, 105.	43F	218, 219.
16	32.	34	8.	43G	138F, 213.
16A	100, 101, 149, 150.	35C	205, 71, 72C.	44A	140B, 140A, 214.
16B	151.	35D	72D.	44B	140C.
16C	152.	35E	6A, 7A.	44C	220.
16D	153.	35F	7B.	44D	221.
17	46, 45.	36B	158, 159, 6A.	44E	222.
18A	88A.	36C	160.	44F	140D, 141A.
18B	88B, 86, 75.	36D	161, 162, 163.	45A	141A, 143A, 143B, 143C, 143D.*
19C	251.	36F	163, 164A.	45B	223, 224.
19	96, 93.	36G	164B, 165.	46B	141A, 142B, 261.
20	55, 54, 53, 52, 51, 49, 48.	36H	157B.	47B	4B.

\* The mean was taken at Blairsville Intersection of 141A and 143A, and 141A and 143B.

Link or equation.	References.	Link or equation.	References.	Link or equation.	References.
47C	4C.	57	156, 171, 172, 173, 174.	76	169D, 169E.
47D	226.	58	176, 234, 237, 238, 239.	77	167A.
47F	225B.	59	156, 155, 154.	78	167B, 6A.
47G	225A.	60	122, 123, 124.	79	166A.
47H	255.	61	181A, 240, 242, 243.	80	166B.
47I	256.	62	194, 116.	81	273.
47J	257, 258.	63	113.	82	270, 272.
48	3.	64	17A, 178, 179, 180, 187.	83	269.
49B	59A, 59B.	65	186.	84	169E, 274.
50	1, 2.	66	231, 233A, 244, 246.	85	227, 275, 141A.
51A	211.	67	4E.	86	141A, 270.
51B	213, 212.	68	259.	87	278, 279.
52A	133A, 133B, 133C, 133D, 133E, 133F, 133G, 133H.	69	4D.	88	281, 192B, 193, 208.
53	135.	70	260.	89	190A.
54B	170B.	71	261, 262.	90	277, 280.
54C	170A, 1.	72	263.	91	282.
55	219, 228, 229.	73	264.	92	283.
56	175.	74	265, 266, 267, 268.	93	284, 285.
		75	169C.		

All leveling by the Coast and Geodetic Survey previous to 1899 has been corrected for systematic error before using it to form observation equations. The formula derived in 1899 (see pages 442-444, 446, Appendix 8, Report for 1899) was again used, as the evidence indicated that a new computation of the constants of this formula would give values agreeing closely with the values there given. These corrections for systematic error are shown in the tables on pages 77-79.

*Observation equations, 1907.*

No. of equation or link.	Observed difference.	Weight p.	Adjusted difference.	Correc-tion v.	pt.	
	m.		m.	mm.	mm.	
1A	Smithland, XLV-Biloxi, Sea level.....	+ 14.8235	1.3	+ 14.8127	- 10.8	152
4B	Vidalia, LXIV-Smithland, XLV.....	+ 5.0726	4.3	+ 5.0490	- 23.6	2 395
5B	Monroe, 27-Shreveport, 46.....	+ 35.8766	3.6	+ 35.8470	+ 29.6	3 154
5C	Shreveport, 46-Barbin, 53.....	+ 35.4949	1.6	+ 35.5593	+ 74.4	8 857
5D	Barbin, 53-Smithland, XLV.....	+ 9.3550	7.5	+ 9.3066	+ 11.6	1 009
6A	Monroe, 27-Columbia, 137.....	+ 5.5958	8.2	+ 5.6129	+ 13.1	1 407
6B	Columbia, 137-Jonesville, 4.....	+ 1.7178	6.4	+ 1.7177	- 0.1	0
6C	Jonesville, 4-Vidalia, LXIV.....	+ 3.3032	12.5	+ 3.3007	+ 2.5	78
6D	Jonesville, 4-Barbin, 53.....	+ 7.6127	5.6	+ 7.6183	- 5.6	176
7A	Rayville, 16-Archibald, "Archibald".....	+ 1.0508	33	+ 1.0449	- 5.9	1 149
7B	Archibald, "Archibald"-Vidalia, LXIV.....	+ 3.7046	4.7	+ 3.6860	- 18.6	1 626
7C	Archibald, "Archibald"-Columbia, 137.....	+ 5.2811	8.9	+ 5.2690	- 12.1	1 303
8A	Vicksburg, SW. Base-Vidalia, LXIV.....	+ 6.9112	3.4	+ 6.8977	- 13.5	620
9	Wilkersons Landing, 84-Monroe, 27.....	+ 18.4769	2.5	+ 18.4991	+ 22.2	1 232
10	Rayville, 16-Monroe, 27.....	+ 0.6914	15	+ 0.7010	+ 9.6	1 382
11A	Vicksburg, SW. Base-Rayville, 16.....	+ 2.1750	6.3	+ 2.1668	- 8.2	424
12A	Wilkersons Landing, 84-Vicksburg, SW. Base.....	+ 15.6962*	0.046	+ 15.6313	- 64.9	194
13A	Wilkersons Landing, 84-Vicksburg, SW. Base.....	+ 15.6987†	1.7	+ 15.6313	- 57.4	5 601
14A	Meridian, C-Vicksburg, SW. Base.....	+ 77.9777	0.032	+ 78.0695	+ 111.8	400
15	Meridian, C-Biloxi, Sea level.....	+ 105.2009	0.016	+ 104.8469	- 352.0	1 982
16	Corinth, V-Meridian, C.....	+ 32.6807	0.016	+ 32.7558	+ 75.1	89
16A	Decatur, 50-Meridian, C.....	+ 64.7374	1.8	+ 64.7356	- 1.8	6
16B	Tuscumbia, 9-Corinth, V.....	+ 5.5652	40	+ 5.5647	- 0.5	10
16C	Decatur, 50-Tuscumbia, 9.....	+ 26.4098†	5.8	+ 26.4151	+ 5.3	163
16D	Decatur, 50-Tuscumbia, 9.....	+ 26.4163*	42	+ 26.4151	- 1.2	60
17	Little Rock, I or 3-Wilkersons Landing, 84.....	+ 38.1423	0.048	+ 38.0835	- 58.8	166
18A	Little Rock, I or 3-Camden, IV.....	+ 45.2904	2.7	+ 45.2902	- 0.2	0
18B	Camden, IV-Monroe, 27.....	+ 11.2870	2.7	+ 11.2924	+ 5.4	79
19C	Camden, IV-Shreveport, 46.....	+ 24.5491	2.7	+ 24.5546	+ 5.5	82
19	Memphis, "Memphis"-Wilkersons Landing, 84.....	+ 38.2777	1.7	+ 38.2528	- 24.9	1 054
20	Harrisonville, 43-Little Rock, I or 3.....	+ 230.1734	0.0033	+ 229.1392	- 1 034.2	3 530
21	Pleasant Hill, LI-Harrisonville, 43.....	+ 48.3114	9.6	+ 48.3081	+ 3.3	105
22A	Kansas City, 244-Holliday, LXIII.....	+ 2.9338	3.0	+ 2.9442	+ 10.4	324
22B	Holliday, LXIII-Harrisonville, 43.....	+ 76.3982	0.28	+ 76.5245	- 126.3	4 460
22E	Abilene, Y <sub>1</sub> -Norfolk, N <sub>1</sub> .....	+ 113.4466	6.4	+ 113.4508	+ 9.8	615
22F	Abilene, Y <sub>1</sub> -Holliday, LXIII.....	+ 117.7707	0.028	+ 117.6250	- 145.7	594
22H	Limon, N-Abilene, Y <sub>1</sub> .....	+ 281.4225	0.0047	+ 281.3368	- 85.7	472
22I	Denver, A <sub>1</sub> -Limon, N.....	+ 47.0880‡	0.063	+ 47.1634	+ 75.4	268
22J	Denver, A <sub>1</sub> -Limon, N.....	+ 47.3801§	0.027	+ 47.1634	+ 216.7	1 268

\* Coast and Geodetic Survey.

† United States Engineers.

‡ Direct.

§ Via Colorado Springs.

## Observation equations, 1907—Continued.

No. of equation or link.	Observed difference.	Weight <i>p</i> .	Adjusted difference.	Correc- tion <i>v</i> .	<i>pv</i> .
23	Kansas City, 244—Pleasant Hill, LI.	31.2026	0.77	31.1606	+ 42.0
24	Jefferson City, 90—Pleasant Hill, LI.	91.3198	0.042	91.3287	— 8.9
25	Kansas City, 244—Jefferson City, 90.	60.2292	1.6	60.1681	— 61.1
26	St. Louis, K <sub>3</sub> —Jefferson City, 90.	43.5512*	0.038	43.7765	— 225.3
27	St. Louis, K <sub>3</sub> —Jefferson City, 90.	43.8270†	2.1	43.7765	+ 50.5
28	Calro, 2—Memphis, "Memphis"	16.7198	1.5	16.7025	— 17.3
29	Corinth, V—Memphis, "Memphis"	57.1960	0.070	56.9612	— 234.8
30	Calro, 2—Corinth, V.	40.4428	0.022	40.2587	+ 184.1
31	St. Louis, K <sub>3</sub> —Calro, 2.	28.8706	1.8	28.8541	— 16.5
32	Odin, V—Calro, 2.	63.3052	0.044	63.4833	+ 178.1
33A	Savanna, 62—Grafton, 2.	50.2177	0.93	50.2786	+ 60.9
33B	Grafton, 2—St. Louis, K <sub>3</sub> .	4.0825	8.7	4.0874	+ 4.9
34	Odin, V—St. Louis, K <sub>3</sub> .	34.4651	0.15	34.6292	+ 164.1
35C	Trenton, 1877—Deshler, I <sub>1</sub> .	33.4115	23	33.4136	— 2.1
35D	Deshler, I <sub>1</sub> —Cincinnati, T.	50.8004	11	50.7946	— 5.8
35E	Cincinnati, T—Olney, B <sub>3</sub> .	18.3620	0.015	18.4145	+ 52.5
35F	Olney, B <sub>3</sub> —Odin, V.	12.8080	0.22	12.6605	+ 147.8
36B	Cincinnati, T—Harriman Junction, C <sub>1</sub> .	74.8908	7.3	74.8963	— 5.5
36C	Knoxville, 933MC—Harriman Junction, C <sub>1</sub> .	42.5945	37	42.5950	+ 0.5
36D	Morehead City, Sea level—Knoxville, 933MC	284.2108	0.027	284.0746	+ 142.2
36F	Knoxville, 933MC—Cleveland, 875MC	17.8512	0.19	17.7742	— 77.0
36G	Cleveland, 875MC—Brunswick, Sea level.	266.6896	0.035	266.3004	— 389.2
36H	Harriman Junction, C <sub>1</sub> —Chattanooga, 698N.	30.3215	23	30.3206	— 0.9
36I	Chattanooga, 698N—Decatur, 50.	41.5760	15	41.5745	— 1.5
36J	Chattanooga, 698N—Cleveland, 875MC	55.1436	0.48	55.1414	+ 2.2
37C	Grafton, M—Belpre, XL.	114.4429	0.056	114.3834	— 59.5
37E	Pittsburg, 99—Monaca, 25C	17.4672	13	17.4686	+ 1.4
38B	Escanaba, 1—Marquette, 1.	5.1567	14	5.1484	+ 8.3
39A	Escanaba, 1—Sand Beach, E.	3.1775	6.0	3.1748	— 2.7
39C	Sand Beach, E—Chicago, 99.	2.5875	3.5	2.5733	+ 14.2
39D	Chicago, 99—Savanna, 62.	0.2105	2.2	0.1960	+ 14.5
40A	Marquette, 1—Detour, Goetz.	2.4044	2.3	2.4908	+ 76.4
40B	Escanaba, 1—Detour, Goetz.	2.6585	11	2.6076	— 9.1
40C	Detour, Goetz—Sand Beach, E.	5.8360	12	5.8424	+ 6.4
40D	Sand Beach, E—Trenton, 1877.	6.1696	9.8	6.1675	+ 1.1
41A	Trenton, 1877—Buffalo, L. H.	4.0743	5.2	4.0855	+ 11.2
42A	Buffalo, L. H.—Oswego, A.	103.0865	12	103.0909	+ 4.4
43A	Salamanca, 1391D—Buffalo, L. H.	244.1209	0.18	244.2510	+ 180.1
43B	Hornellsville, 1141D—Salamanca, 1391D.	75.9076	0.18	75.9001	+ 7.5
43C	Oswego, A—Hornellsville, 1141D.	271.4866	0.17	271.4418	+ 44.8
43D	Elmira, 857A—Hornellsville, 1141D.	86.5039	0.26	86.5280	— 24.1
43E	Bainbridge, 989A—Elmira, 857A.	39.9664	0.16	39.9530	— 13.4
43F	Utica, L. S. 92—Bainbridge, 989A.	170.4278	0.24	170.4690	— 31.2
43G	Greenbush, Gristmill—Bainbridge, 989A.	297.3734	0.14	297.4253	— 51.9
44A	Leboeuf, 1193P—Buffalo, L. H.	184.2006	0.65	184.1250	— 75.6
44B	Franklin, 987P—Leboeuf, 1193P.	62.8310	0.27	62.9415	— 110.5
44C	Irvinton, 1167D—Leboeuf, 1193P.	7.9602	0.38	8.0110	— 50.8
44D	Irvinton, 1167D—Franklin, 987P.	54.9415	0.26	54.9305	— 11.0
44E	Salamanca, 1391D—Irvinton, 1167D.	68.1732	0.61	68.1370	— 36.2
44F	Pittsburg, 99—Franklin, 987P.	74.2653	0.16	74.4344	— 169.1
45A	Harrisburg, XXIX—Pittsburg, 99.	118.0141	0.057	117.8877	+ 126.4
45B	Elmira, 857A—Harrisburg, XXIX.	152.9102	0.080	152.9615	+ 51.3
46B	Pittsburg, 99—Grafton, M.	77.1118	0.12	77.0459	+ 65.9
47B	Hancock, F—Cumberland, I.	61.7904*	0.18	61.8905	— 100.1
47C	Hagerstown, H—Hancock, F.	40.0487	0.64	40.0266	— 23.1
47D	Hancock, F—Cumberland, I.	61.9468†	0.20	61.8905	+ 56.3
47F	Washington, Capitol—Washington Junction, 44A.	43.4779	0.26	43.4627	+ 15.2
47G	Washington Junction, 44A—Hancock, F.	57.2077	0.20	57.1679	+ 39.8
47H	Relay, 31—Washington, Capitol.	5.7282	0.38	5.7446	— 16.4
47I	Relay, 31—Washington Junction, 44A.	49.2281	0.19	49.2073	+ 20.8
47J	Relay, 31—Baltimore, Sea level.	21.8572	1.5	21.8587	+ 1.5
48	Harrisburg, XXIX—Hagerstown, H.	59.4816	0.12	59.5203	— 38.7
49B	Hagerstown, H—Washington, Capitol.	140.5379	0.085	140.6572	+ 119.3
50	Sea level at Sandy Hook—Harrisburg, XXIX.	108.6643	0.022	108.7402	— 75.9
51A	Utica, L. S. 92—Oswego, A.	54.4108	23	54.4078	— 3.0
51B	Greenbush, Gristmill—Utica, L. S. 92.	126.9618	17	126.9663	— 4.5
52A	Oswego, A—Greenbush, Gristmill.	72.5735‡	1.6	72.5585	— 15.0
53	Boston, Sea level—Greenbush, Gristmill.	4.2898	0.072	4.2294	+ 60.4
54B	Greenbush, Gristmill—Poughkeepsie, 173A.	48.5028	26	48.5003	+ 2.5
54C	Poughkeepsie, 173A—Sandy Hook, Sea level.	52.7282	34	52.7297	+ 1.5
55	Bainbridge, 989A—Poughkeepsie, 173A.	249.0783	0.082	248.9250	— 153.3
56	Denver, A—Cheyenne, B.	262.6197	18	262.6197	0.0
57	Cheyenne, B—Norfolk, N.	383.3802	3.1	383.3563	— 23.9
58	Cheyenne, B—Seattle, Sea level.	847.4497	1.3	847.5070	+ 57.3
59	Norfolk, N—Sioux City, 399.	128.9789	26	128.9784	— 0.5
60	Sioux City, 399—Kansas City, 244.	105.1242	1.0	105.0276	— 96.6
61	St. Paul, 68—Sioux City, 399.	120.6951	2.0	120.7377	— 42.6
62	Marquette, 1—St. Paul, 68.	28.2743	1.5	28.3146	— 40.3
63	St. Paul, 68—Savanna, 62.	33.8437	1.0	33.8885	+ 24.8

\* Coast and Geodetic Survey.  
† United States Engineers.

‡ Baltimore and Ohio Railroad.  
§ Via Lake Champlain.

## Observation equations, 1907—Continued.

No. of equation or link.	Observed difference.	Weight <i>p</i> .	Adjusted difference.	Correc- tion <i>v</i> .	<i>pv</i> <sup>2</sup> .	
	<i>m</i> .		<i>m</i> .	<i>mm</i> .	<i>mm</i> .	
64	Ablene, Y <sub>2</sub> —Fort Worth, U.....	+165.9917	4.0	+165.9770	-14.7	864
65	Fort Worth, U—Shreveport, 46.....	+124.9945	7.3	+124.9983	+3.8	105
66	Fort Worth, U—Galveston, Sea level.....	+184.7546	4.9	+184.7369	-17.7	1 535
67	Cumberland, I—Amblersburg, L.....	-304.8499*	0.12	-304.7694	+80.6	778
68	Cumberland, I—Amblersburg, L.....	-304.6561†	0.15	-304.7694	-113.3	1 926
69	Amblersburg, L—Grafton, M.....	+191.1645*	0.69	+191.2200	+55.5	2 125
70	Amblersburg, L—Grafton, M.....	+191.3401†	0.38	+191.2200	-120.1	5 481
71	Grafton, M—Benwood, 94A.....	+106.1251	0.14	+106.1527	+27.6	107
72	Benwood, 94A—Uhrichsville, 48.....	-65.0215	0.17	-65.3007	-279.2	13 252
73	Uhrichsville 48—Warwick 449.....	-29.3801	0.24	-29.3670	+13.1	41
74	Warwick, 449—Deshler, I.....	+74.8711	0.28	+74.8109	-60.2	1 015
75	Monaca, 25C—Benwood, 94A.....	+11.6321	4.5	+11.6382	+6.1	167
76	Benwood, 94A—Belpre, XL.....	+8.2110	4.0	+8.2307	+19.7	1 552
77	Belpre, XL—Portsmouth, U. S. E.....	+26.1723	1.8	+26.1827	+10.4	195
78	Portsmouth, U. S. E.—Cincinnati, T.....	-3.4895	2.3	-3.4756	+13.9	444
79	Belpre, XL—Chillicothe, Q.....	-5.1469	0.064	-5.1728	-25.9	43
80	Chillicothe, Q—Cincinnati, T.....	+27.9689	0.064	+27.8799	-109.0	760
81	Portsmouth, U. S. E.—Chillicothe, Q.....	-31.3551	38	-31.3555	-0.4	6
82	Chillicothe, Q—Zanesville, U. S. E. 1.....	-18.6275	18	-18.6280	-0.5	4
83	Zanesville, U. S. E. 1—Uhrichsville, 48.....	-49.7325	27	-49.7306	+1.9	97
84	Belpre, XL—Zanesville, U. S. E. 1.....	-23.8150	4.1	-23.8008	+14.2	827
85	Cumberland, I—Pittsburg, 99.....	-36.5133	0.074	-36.5035	+9.8	7
86	Pittsburg, 99—Ellwood City, 349.....	-44.7379	0.25	-44.7026	+35.3	312
87	Ellwood City, 349—Monaca, 25C.....	+62.1709	115	+62.1712	+0.3	10
88	Warwick, 449—Buffalo, L. H.....	+112.2295	0.25	+112.3100	+80.5	1 620
89	Monaca, 25C—Alliance, Br. 66.....	-124.9438	0.21	-124.8422	+101.6	2 168
90	Ellwood City, 349—Alliance, Br. 66.....	-62.6246	0.46	-62.6710	-46.4	990
91	Pekin, 49—Grafton, 2.....	+8.5321	2.0	+8.5253	-6.8	92
92	Chicago, 99—Pekin, 49.....	+41.5467	1.7	+41.5573	+10.6	191
93	Pekin, 49—Olney, B <sub>2</sub> .....	-9.3597	8.5	-9.3560	+3.7	116

\* Coast and Geodetic Survey.

† Baltimore and Ohio Railroad.

## ASSIGNMENT OF WEIGHTS.

Before beginning the adjustment, the question of what relative weights should be assigned to the different classes of leveling was again carefully considered. The same criterion for determining these relative weights that had been used in 1899 and 1903 was again used—that is, that after the adjustment is made the mean value of  $pv^2$  for each of the groups into which the leveling is divided with respect to assigned weights should be as nearly as possible the same. As even a large change in relative weights produces but small changes in the computed elevations, it is not advisable to change the weight assigned to any class of leveling unless the evidence is clear that a change of at least 25 per cent should be made.

A careful estimate was made of the probable effect of the new leveling upon derived elevations and of the probable resulting values of  $pv^2$ . From this estimate the following scale of weights was assigned for a trial solution.  $L$  is the length of the link in kilometers.

*Weights used in first solution.*

Class of lines.	Weight <i>p</i> .
Coast and Geodetic Survey leveling of 1899 and later; U. S. Geological Survey leveling of 1905 and 1906; and water leveling on lakes, except short series of observations*.....	1000 <i>L</i>
Engineer lines with Kern instrument and U. S. Lake Survey lines.....	500 <i>L</i>
Wye levels run under the direction of the Corps of Engineers, U. S. Army, and Board of Engineers on Deep Waterways.....	300 <i>L</i>
U. S. Geological Survey leveling previous to 1905 and Van Orden leveling.....	24 <i>L</i>
Leveling by the Baltimore and Ohio Railroad Company.....	24 <i>L</i>
Leveling by the Pennsylvania Railroad Company.....	15 <i>L</i>
Coast and Geodetic Survey leveling previous to 1899.....	1600 <i>L</i> <sup>2</sup>

It may be noted that the principal change in these weights compared with those used in 1903 (see page 373 of Appendix 3, Report for 1903) was the reduction in weight of the Engineer leveling and of the Baltimore and Ohio Railroad leveling.

In 1903 the Engineer leveling, Coast and Geodetic Survey leveling of 1899 and later, and certain other leveling, were classed together. The average  $pv^2$  from the 1903 adjustment was 1 077 for the whole class, but the average  $pv^2$  for the Coast and Geodetic Survey lines was 756 and for the Engineer lines 1 294. The estimated  $pv^2$ 's from this adjustment showed a similar difference. This indicated that the weight of the Engineer leveling was too great, and it was therefore reduced from 1000 to 500.

The weight assigned to the Baltimore and Ohio Railroad leveling in 1903 was based on the results from only a few lines. The further evidence of the degree of accuracy afforded by the new lines and by the releveing of the Coast and Geodetic Survey along the Baltimore and Ohio lines showed that the weight assigned to that class of leveling in 1903 was much too large.

An adjustment of the net was made with the weights given above, and the average values of  $pv^2$  for the various groups were:

Class of lines.	Weight <i>p</i> .	Average $pv^2$ .
Coast and Geodetic Survey leveling of 1899 and later; U. S. Geological Survey leveling of 1905 and 1906; and water leveling on lakes, except short series of observations.....	1000 <i>L</i>	559
Engineer lines with Kern instrument.....	500 <i>L</i>	1 515
U. S. Lake Survey lines.....	500 <i>L</i>	151
Wye levels run under the direction of the Corps of Engineers, U. S. Army, and Board of Engineers on Deep Waterways.....	300 <i>L</i>	680
U. S. Geological Survey leveling previous to 1905 and Van Orden leveling.....	24 <i>L</i>	1 264
Leveling by the Baltimore and Ohio Railroad Company.....	24 <i>L</i>	1 741
Leveling by the Pennsylvania Railroad Company.....	15 <i>L</i>	917
Coast and Geodetic Survey leveling previous to 1899.....	1600 <i>L</i> <sup>2</sup>	1 236
Average value of $pv^2$ from all lines.....		1 158

\*If a series of simultaneous self-registering gauge readings at two points was less than eight months long (four summer months during each of two years) or a series of simultaneous tri-daily staff gauge readings less than sixteen months (four summer months during four years), the weight assigned to the line joining these points was reduced below  $\frac{1000}{L}$ .



It is evident from this that the Coast and Geodetic Survey leveling of 1899 and later was given too small a weight and the Engineer leveling too large; that the Lake Survey leveling should be considered with the Coast and Geodetic Survey leveling and not with the Engineer leveling, and that the Baltimore and Ohio Railroad leveling was still given too great a weight.

A second scale of weights was assigned. They are given in the following table, with the average  $pv^2$  for each group from the final adjustment of the net with these weights. These are the adopted weights which were used in the final adjustment of the level net in 1907.

*Weights used in adjustment of 1907.*

Class.	Lines.	Number of equations.	Weight $p$ .	Average $pv^2$ .
1	Coast and Geodetic Survey leveling of 1899 and later; U. S. Geological Survey leveling of 1905 and 1906; U. S. Lake Survey leveling, and water leveling on lakes, except short series of observations.....	35	3000 $L$	917
2	Engineer lines with Kern instrument; and wye levels run under the direction of the Corps of Engineers, U. S. Army, and Board of Engineers on Deep Waterways.....	42	500 $L$	1 537
3	U. S. Geological Survey leveling previous to 1905, and Van Orden leveling.....	20	24 $L$	1 364
4	Leveling by the Pennsylvania Railroad Company.....	3	20 $L$	1 097
5	Leveling by the Baltimore and Ohio Railroad Company.....	16	18 $L$	1 622
6	Coast and Geodetic Survey leveling previous to 1899.....	32	1600 $L^2$	1 230
Average value of $pv^2$ from all lines.....				1 301

These average values of  $pv^2$  indicate that class 1 probably still has too small a weight and classes 2 and 5 too large, but the evidence is not sufficient to warrant any changes at this time. The effect of any further change in the above weights on the adjusted elevations would be small. The maximum effect on the elevation of any junction point of the changes made from the weights used in the first or trial solution to those used in the final solution was but 48 millimeters. Only four elevations were changed as much as 4 centimeters and these four were closely related. Two-thirds of the elevations were changed less than 2 centimeters. The general effect was to lower the elevations, as all but 15 were lowered, and of these 15 the maximum increase in elevation was but 5 millimeters.

The formation of normal equations from the observation equations by the method of least squares and their solution gave the new adjusted elevations shown in the table on page 75. For the purpose of showing clearly the effects of the new lines, the elevations as adjusted in 1903 are also placed in the table and the differences (1907-1903) are shown.

The resulting probable error of an observation of unit weight is  $\pm 36.4$  millimeters; that is, this is the probable error of the observed difference of elevation on the two ends of a line of such a length as to be assigned unit weight; for instance, 3 000 kilometers of leveling of class 1, to which was assigned leveling of the Coast and Geodetic Survey of 1899 and later, of the United States Geological Survey in 1905 and 1906, and of the United States Lake Survey. This probable error of

$\pm 36.4$  millimeters for an observation of unit weight corresponds to a probable error of  $\pm 0.67$  millimeter for 1 kilometer of leveling of class 1.

The probable error of 1 kilometer of the same leveling in 1903 was  $\pm 1.04$  millimeters,\* corresponding to a probable error of  $\pm 32.8$  millimeters\* for an observation of unit weight in that adjustment. An observation of unit weight, however, in 1903, was 1 000 kilometers of the leveling which is now included in class 1, or of Engineer leveling with Kern instruments.

The probable error of the elevation of bench mark  $K_3$  at St. Louis is found from the 1907 adjustment to be  $\pm 29$  millimeters. The probable error of this elevation computed from the 1903 adjustment was  $\pm 32$  millimeters. It was stated in 1903\* that it was an even chance that the elevation computed from the adjustment of 1903 would not be changed more than 32 millimeters by any amount of new leveling, and it was almost certain that it would not be changed by as much as 15 centimeters, or 6 inches. From the table on page 75 it may be seen that the new leveling changed the elevation of St. Louis, as adjusted in 1903, by 22.5 millimeters.

#### ADOPTED ELEVATIONS OF JUNCTION POINTS.

Having thus secured the theoretically most accurate elevations for the junction points, the question of adopting as standard elevations for present use such values as will produce the minimum disturbance in past publications, and the minimum inconvenience in the revision of past computations, now arises. This question has already been touched upon in the general statement at the beginning of this publication (see p. 8).

It is desirable to make as few changes as is allowable in the elevations and differences of elevations already published in Appendix 3, Report for 1903. The following decision is based upon the supposition that to hold old elevations unchanged or to correct a group of them by a constant which is an integral number of centimeters is certainly allowable, *Provided*, 1. That by so doing a considerable number of old elevations or differences of elevation are retained unchanged; 2. That every assigned elevation agrees with the elevation derived from the latest adjustment within 1.2 times the probable error of said elevation derived from the latest adjustment; 3. That every assigned difference of elevation between junction points agrees with the value of that difference derived from the latest adjustment within 1.2 times the probable error of observation of said difference.

In special cases where it is especially desirable for unusual reasons to hold former adopted elevations unchanged, it is allowable to exceed the above limits slightly.

It was decided to retain the 1903 values unchanged for all elevations on the Great Lakes; on the lines of the Coast and Geodetic Survey leveling from Gibraltar southward; for the whole New York region; for Williamsport, Irvineton, Leboeuf, Franklin, Pittsburg, and Monaca, Pa.; for East Akron Junction, Ohio; for St. Louis and Jefferson City, Mo.; Grafton and Cairo, Ill; for Washington, D. C.; and in Texas, from Bowie to Holland. It was also decided to correct the 1903 adopted value at Savanna, Ill., by  $+3$  centimeters; to adopt such values for the

\*See Appendix 3, Report for 1903, page 379.

elevations at Ellwood City and Alliance, Ohio, that the differences of elevation on the lines from these points to Monaca will be the theoretical best; to adopt such a value for the elevation of Warwick, Ohio, that the differences of elevation on the line to East Akron Junction will be the theoretical best. These adopted elevations are given in the following table, with the adjusted elevations of the same points and the difference between them. For all other junction points in the net the elevations given by the final 1907 adjustment were adopted. All adopted elevations are also given in the table on page 75 for comparison with the elevations for the same points adopted in 1903.

Junction point.	Adjusted elevation.	Adopted elevation.	Difference.	Junction point.	Adjusted elevation.	Adopted Elevation.	Difference.
	m.	m.	mm.		m.	m.	mm.
Forth Worth, U.	184.7369	184.7280	- 8.9	Trenton, 1877.	183.9643	183.9457	-18.6
Meridian, C.	104.8489	104.8587	+ 9.8	Deshler, I.	217.3779	217.3654	-12.5
Decatur, P. B. M. 50.	169.5845	169.5959	+11.4	Warwick, 449.	292.1888	292.1003	-88.5
Tusculumla, T. B. M. 9.	143.1694	143.1832	+13.8	Monaca, 25C.	209.1593	209.2284	+69.1
Harriman, Junction, C.	241.4796	241.4888	+ 9.2	Alliance, Br. 66.	334.0015	334.0706	+69.1
Chattanooga, 998 N.	211.1590	211.1690	+10.0	Ellwood City, 349.	271.3305	271.3996	+69.1
Knoxville, 933 MC.	284.0746	284.0848	+10.2	Leboeuf, 1193 P.	364.0038	363.9980	- 7.8
Cleveland, Tenn., 875 MC.	266.3004	266.3100	+ 9.6	Franklin, 987 P.	301.0623	301.0750	+12.7
Jefferson City, 90.	169.9766	169.9869	+10.3	Irvinton, 1167 D.	355.9928	355.9911	- 1.7
Corinth, V.	137.6047	137.6187	+14.0	Pittsburg, 99.	226.6279	226.6992	+71.3
Calro, 2.	97.3460	97.3258	-20.2	Washington, Capitol.	27.6033	27.6409	+37.6
St. Louis, K.	126.2001	126.1776	-22.5	Elmira, 857 A.	261.7017	261.7098	+ 8.1
Grafton, Ill., 2.	130.2875	130.2623	-25.2	Hornellsville, 1141 D.	348.2297	348.2288	- 0.9
Savanna, 62.	180.5661	180.5371	-29.0	Salamanca, 1391 D.	424.1298	424.1256	- 4.2
Chicago, 99.	180.3701	180.3077	-62.4	Buffalo, L. H.	179.8788	179.8630	-15.8
Cincinnati, T.	166.5833	166.5849	+ 1.6	Bainbridge, 989 A.	301.6547	301.6531	- 1.6
Marquette, I.	186.1200	186.0774	-42.6	Poughkeepsie, 173 A.	52.7297	52.7276	- 2.1
Esplanada, 1.	180.9716	180.9320	-39.6	Utica, L. S. 92.	131.1967	131.1893	- 6.4
Detroit, Goetz.	183.6392	183.6017	-37.5	Oswego, A.	76.7879	76.7788	- 9.1
Sand Beach, E.	177.7968	177.7620	-34.8	Greenbush, Gristmill.	4.2294	4.2255	- 3.9

In the following table are given the adjusted and adopted values of the elevations of the junction points from the adjustments of 1903 and 1907.

In the fourth column is given the difference between the two adjusted values, showing the effect of the introduction of the new leveling into the level net.\* In the seventh column is given the difference between the two adopted values, showing the changes now made in the values printed in Appendix 3, Report for 1903. In the table which precedes this has already been shown the difference between the adopted values and the adjusted values.

\*For the effect of change in weights, see p. 72 of this publication, and Appendix 3, Report for 1903, p. 389. For results of previous adjustments, see Appendix 3, Report for 1903, pp. 387-389.

Junction point.	Adjusted elevation.			Adopted elevation.		
	1903.	1907.	Difference.	1903.	1907.	Difference.
Smithland, XLV.....	m. 14.8406	m. 14.8127	m.m. - 27.9	m. 14.8517	m. 14.8127	m.m. - 39.0
Vidalia, LXIV.....	19.7864	19.8617	+ 75.3	19.7833	19.8617	+ 78.4
Barbin, T. B. M. 53.....		24.1793			24.1793	
Jonesville, P. B. M. 4.....		16.5610		16.4856	16.5610	+ 75.4
Columbia, T. B. M. 137.....		18.2787			18.2787	
Monroe, P. B. M. 27.....	23.8290	23.8916	+ 62.6	23.8258	23.8916	+ 65.8
Shreveport, P. B. M. 46.....	59.7064	59.7386	+ 32.2	59.7023	59.7386	+ 36.3
Fort Worth, U.....		184.7369		184.7280	184.7280	0.0
Archibald, P. B. M. Archibald.....		23.5477		23.4706	23.5477	+ 77.1
Rayville, P. B. M. 16.....	24.5214	24.5926	+ 71.2	24.5187	24.5926	+ 73.9
Vicksburg, SW. Base.....	26.6856	26.7594	+ 73.8	26.6842	26.7594	+ 75.2
Meridian, C.....	104.8587	104.8489	- 9.8	104.8587	104.8587	0.0
Decatur, P. B. M. 50.....	109.5959	109.5845	- 11.4	109.5959	109.5959	0.0
Tusculum, T. B. M. 9.....	143.1832	143.1694	- 13.8	143.1832	143.1832	0.0
Harriman Junction, C.....	241.4888	241.4796	- 9.2	241.4888	241.4888	0.0
Chattanooga, 698 N.....	211.1690	211.1590	- 10.0	211.1690	211.1690	0.0
Knoxville, 933 MC.....	284.0848	284.0746	- 10.2	284.0848	284.0848	0.0
Cleveland, 875 MC.....	266.3100	266.3004	- 9.6	266.3100	266.3100	0.0
Wilkinson Landing, P. B. M. 84.....	42.3300	42.3907	+ 60.7	42.3304	42.3907	+ 60.3
Camden, P. B. M. IV.....		35.1840		35.1142	35.1840	+ 69.8
Little Rock, I or 3.....	80.4065	80.4742	+ 67.7	80.4034	80.4742	+ 70.8
Harrisonville, T. B. M. 43.....	309.6612	309.6134	- 47.8	309.6612	309.6134	- 47.8
Pleasant Hill, L1.....	261.3531	261.3053	- 47.8	261.3531	261.3053	- 47.8
Holliday, LXIII.....	233.1386	233.0889	- 49.7	233.1386	233.0889	- 49.7
Kansas City, 244.....	230.1944	230.1447	- 49.7	230.1944	230.1447	- 49.7
Cheyenne, B.....	1 847.6372	1 847.5070	-130.2	1 847.6372	1 847.5070	-130.2
Denver, A.....	1 585.0175	1 584.8873	-130.2	1 585.0175	1 584.8873	-130.2
Limon, N.....	1 632.1782	1 632.0507	-127.5	1 632.1782	1 632.0507	-127.5
Abilene, Ya.....	350.7773	350.7139	- 63.4	350.7773	350.7139	- 63.4
Norfolk, N.....	464.2569	464.1507	-106.2	464.2569	464.1507	-106.2
Sioux City, P. B. M. 399.....	335.2881	335.1723	-115.8	335.2881	335.1723	-115.8
St. Paul, P. B. M. 68.....	214.3512	214.4346	+ 83.4	214.3512	214.4346	+ 83.4
Jefferson City, 90.....	169.9869	169.9766	- 10.3	169.9869	169.9869	0.0
Memphis, P. B. M. Memphis.....	80.5987	80.6435	+ 44.8	80.6065	80.6435	+ 37.0
Corinth, V.....	137.6187	137.6047	- 14.0	137.6187	137.6187	0.0
Cairo, P. B. M. 2.....	97.3120	97.3460	+ 34.0	97.3258	97.3258	0.0
St. Louis, K.....	126.1776	126.2001	+ 22.5	126.1776	126.1776	0.0
Grafton, P. B. M. 2.....	130.2623	130.2875	+ 25.2	130.2623	130.2623	0.0
Savanna, P. B. M. 62.....	180.5071	180.5661	+ 59.0	180.5071	180.5371	+ 30.0
Chicago, P. B. M. 99.....	180.3077	180.3701	+ 62.4	180.3077	180.3077	0.0
Pekin.....		138.8128			138.8128	
Olney, B.....		148.1688		147.9296	148.1688	+239.2
Odin, V.....	160.6555	160.8293	+173.8	160.6675	160.8293	+161.8
Cincinnati, T.....	166.5849	166.5833	- 1.6	166.5849	166.5849	0.0
Marquette, I.....	186.0774	186.1200	+ 42.6	186.0774	186.0774	0.0
Escanaba, I.....	180.9320	180.9716	+ 39.6	180.9320	180.9320	0.0
Detour, P. B. M. Goetz.....	183.6017	183.6392	+ 37.5	183.6017	183.6017	0.0
Sand Beach, E.....	177.7620	177.7968	+ 34.8	177.7620	177.7620	0.0
Trenton, 1877.....	183.9457	183.9643	+ 18.6	183.9457	183.9457	0.0
Deshler, I.....	217.3654	217.3779	+ 12.5	217.3654	217.3654	0.0
Warwick, B. & O. 449.....		292.1888			292.1003	
Uhrichsville, B. & O. 48.....		262.8218			262.8218	
Zanesville, U. S. E. 1.....		213.0912			213.0912	
Chillicothe, Q.....	194.5181	194.4632	- 54.9	194.5181	194.4632	- 54.9
Portsmouth, U. S. E.....		163.1077			163.1077	
Belpre, XL.....	189.3484	189.2904	- 58.0	189.3484	189.2904	- 58.0
Benwood, 94 A.....		197.5211			197.5211	
Monaca, 25 C.....	209.2284	209.1593	- 69.1	209.2284	209.2284	0.0
Alliance, Br. 66.....	334.2868	334.0015	-285.3	334.2868	334.0706	-216.2
Ellwood City, B. & O. 349.....		271.3305			271.3996	
Leboeuf, 1193 P.....	363.9960	364.0038	+ 7.8	363.9960	363.9960	0.0
Franklin, 987 P.....	301.0750	301.0623	- 12.7	301.0750	301.0750	0.0
Irvineton, 1167 D.....	355.9911	355.9928	+ 1.7	355.9911	355.9911	0.0
Pittsburg, P. R. R. 99.....	226.6992	226.6279	- 71.3	226.6992	226.6992	0.0
Grafton, M.....	303.8422	303.6738	-168.4	303.8422	303.6738	-168.4
Amblersburg, L.....	495.0461	494.8938	-152.3	495.0461	494.8938	-152.3
Hancock, F.....	128.3222	128.2339	- 88.3	128.3222	128.2339	- 88.3
Cumberland, I.....	190.2659	190.1244	-141.5	190.2659	190.1244	-141.5
Washington Jct., B. & O. 44 A.....	71.1169	71.0660	- 50.9	71.1169	71.0660	- 50.9
Washington, Capitol.....	27.6409	27.6033	- 37.6	27.6409	27.6409	0.0
Relay, B. & O. 31.....		21.8587			21.8587	
Hagerstown, A.....	168.3395	168.2605	- 79.0	168.3395	168.2605	- 79.0
Harrisburg, XXIX.....	108.7960	108.7402	- 55.8	108.7960	108.7402	- 55.8
Elmira, 857 A.....	261.7098	261.7017	- 8.1	261.7098	261.7098	0.0
Hornellsville, 1141D.....	348.2288	348.2297	+ 0.9	348.2288	348.2288	0.0
Salamanca, 1391D.....	424.1256	424.1298	+ 4.2	424.1256	424.1256	0.0
Buffalo, L. H.....	179.8630	179.8788	+ 15.8	179.8630	179.8630	0.0
Bainbridge, 889A.....	301.6531	301.6547	+ 1.6	301.6531	301.6531	0.0
Poughkeepsie, 173A.....	52.7276	52.7297	+ 2.1	52.7276	52.7276	0.0
Utica, L. S. 92.....	131.1893	131.1957	+ 6.4	131.1893	131.1893	0.0
Oswego, A.....	76.7788	76.7879	+ 9.1	76.7788	76.7788	0.0
Greenbush, Gristmill.....	4.2255	4.2294	+ 3.9	4.2255	4.2255	0.0

Completed direct care of permanent hearing aids.

[illegible]

\* Known also as St. Louis Directrix.

TABLE 1.—Differences of elevation—Continued.

Equa- tion.	Observed.	Corrected for systematic error.	Adjusted 1907.	Adopted 1907.*	Equa- tion.	Observed.	Corrected for systematic error.	Adjusted 1907.	Adopted 1907.*
	m.	m.	m.	m.		m.	m.	m.	m.
78.....	- 3.4895		- 3.4756	- 3.4772	86.....	- 44.7379		- 44.7026	- 44.7004
79.....	- 5.1780	- 5.1469	- 5.1728		87.....	+ 62.1709		+ 62.1712	+ 62.1712
80.....	+ 27.9232	+ 27.9889	+ 27.8799	+ 27.8783	88.....	+ 112.2295		+ 112.3100	+ 112.2373
81.....	- 31.3551		- 31.3555		89.....	- 124.9438		- 124.8422	- 124.8422
82.....	- 18.6275		- 18.6280		90.....	- 62.6246		- 62.6710	- 62.6710
83.....	- 49.7325		- 49.7306		91.....	+ 8.5321		+ 8.5253	+ 8.5505
84.....	- 23.8150		- 23.8008		92.....	+ 41.5467		+ 41.5573	+ 41.4949
85.....	- 36.5133		- 36.5035	- 36.5748	93.....	- 9.3597		- 9.3560	

Table 2 gives for each link the weight, the various corrections applied, and in the third column the probable error of the observed differences except in cases when a correction for systematic error was applied. In these cases the probable error of the corrected difference is given, and the systematic correction is shown in the fourth column.

TABLE 2.—Corrections to differences of elevation.

Equation..	Weight p.	Probable error.	System- atic cor- rection.	Additional cor- rection, adjust- ment of 1907.	Total correction, adjust- ment of 1907.	Total cor- rection, adopted 1907.*
		mm.	mm.	mm.	mm.	mm.
1A.....	1.3	31.9			- 10.8	
4B.....	4.3	17.6			- 23.6	
5B.....	3.6	19.1			+ 29.6	
5C.....	1.6	28.9			+ 74.4	
5D.....	7.5	13.3			+ 11.6	
6A.....	8.2	12.7			+ 13.1	
6B.....	6.4	14.4			- 0.1	
6C.....	12.5	10.3			+ 2.5	
6D.....	5.6	15.4			- 5.6	
7A.....	33	6.3			- 5.9	
7B.....	4.7	16.8			- 18.6	
7C.....	8.9	12.2			- 12.1	
8A.....	3.4	19.7			- 13.5	
9.....	2.5	23.0			+ 22.2	
10.....	15	9.4			+ 9.6	
11A.....	6.3	14.5			- 8.2	
12A.....	0.046	170.1	+ 138.1	- 64.9	+ 73.2	
13A.....	1.7	28.0			- 57.4	
14A.....	0.032	201.3	+ 58.4	+ 111.8	+ 170.2	+ 180.0
15.....	0.016	288.9	+ 270.1	- 352.0	- 81.9	- 72.1
16.....	0.016	288.9	+ 352.0	+ 75.1	+ 427.1	+ 431.3
16A.....	1.8	27.2			- 1.8	- 0.2
16B.....	40	5.8			- 0.5	- 0.7
16C.....	5.8	15.1			+ 5.3	+ 2.9
16D.....	42	5.7			- 1.2	- 3.6
17.....	0.048	166.2	+ 128.4	- 58.8	+ 69.6	
18A.....	2.7	22.2			- 0.2	
18B.....	2.7	22.2			+ 5.4	
18C.....	2.7	22.2			- 5.5	
19.....	1.7	28.0			- 24.9	
20.....	0.0033	634.2	+ 469.0	- 1 034.2	- 565.2	
21.....	9.6	11.7	+ 18.0	+ 3.3	+ 21.3	
22A.....	3.0	21.0	+ 15.8	- 10.4	+ 5.4	
22B.....	0.28	68.8	+ 37.0	- 126.3	- 89.3	
22E.....	6.4	14.4			+ 9.8	
22F.....	0.028	218.0	- 69.8	- 145.7	- 215.5	
22H.....	0.0047	530.6	- 82.1	- 85.7	- 167.8	
22I.....	0.083	126.4	+ 39.2	- 75.4	- 36.2	
22J.....	0.027	222.0	+ 39.2	+ 216.7	+ 255.9	
23.....	0.77	41.5	+ 35.9	+ 42.0	+ 77.9	
24.....	0.042	177.5	+ 27.0	- 8.9	+ 18.1	+ 28.4

\*If no entry is made in this column, the adopted value is the same as the adjusted.



TABLE 2.—*Corrections to differences of elevation—Continued.*

Equation.	Weight <i>p.</i>	Probable error.	System- atic cor- rection.	Addi- tional cor- rection, adjust- ment of 1907.	Total correc- tion, adjust- ment of 1907.	Total cor- rection, adopted 1907.*
		<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>
62	1.5	29.9			- 40.3	- 82.9
63	1.0	36.4			+ 24.8	+ 53.8
64	4.0	18.2			- 14.7	- 5.8
65	7.3	13.5			+ 3.8	+ 5.1
66	4.9	16.5			- 17.7	- 26.6
67	0.12	105.2	+59.5	+ 80.5	+140.0	
68	0.15	94.0			-113.3	
69	0.69	43.8	+14.0	+ 55.5	+ 98.5	
70	0.38	59.1			-120.1	
71	0.14	97.3			+ 27.6	
72	0.17	88.4			-279.2	
73	0.24	74.3			+ 13.1	-101.6
74	0.28	68.8			- 60.2	-136.2
75	4.5	17.2			+ 6.1	+ 75.2
76	4.0	18.2			+ 19.7	
77	1.8	27.2			+ 10.4	
78	2.3	23.9			+ 13.9	+ 12.3
79	0.064	143.9	+31.1	- 28.9	+ 5.2	
80	0.064	143.9	+65.7	-109.0	- 43.3	- 44.9
81	38	6.0			- 0.4	
82	18	8.6			- 0.5	
83	27	7.0			+ 1.9	
84	4.1	18.1			+ 14.2	
85	0.074	133.8			+ 9.8	- 61.5
86	0.25	72.8			+ 35.3	+ 37.5
87	115	3.4			+ 0.3	+ 0.3
88	0.25	72.8			+ 80.5	+ 7.8
89	0.21	79.4			+101.6	+101.6
90	0.46	53.7			- 46.4	- 46.4
91	2.0	25.8			- 6.8	+ 18.4
92	1.7	28.0			+ 10.6	- 51.8
93	8.5	12.5			+ 3.7	

Table 3 shows the same corrections as Table 2, expressed in millimeters per kilometer. The different links have been rearranged and placed in Table 3 in the order of magnitude of the total correction in the adjustment of 1907, in millimeters per kilometer, and serial numbers on this basis have been assigned. The table serves to place the links in order of accuracy as shown by this standard, the most accurate line being placed first. In the column headed "Character of line" a single entry indicates that practically the whole link was of that character. If there are two or more entries, the link is a composite one, in which the character of the longer portion is mentioned first. The symbols 1899+ and 1899- refer to leveling by the Coast and Geodetic Survey in 1899 and later and before 1899, respectively; the abbreviation "G. S. 1905+" refers to leveling done by the United States Geological Survey in 1905 and 1906 with instruments and methods similar to those used by the Coast and Geodetic Survey in 1899 and later; "Geol." refers to leveling by the United States Geological Survey previous to 1905; "Lake" refers to leveling by the United States Lake Survey, and "Water" to water leveling on the lakes.

\* If no entry is made in this column, the adopted value is the same as the adjusted.



TABLE 3.—*Corrections to differences of elevation.*

[Corrections in millimeters per kilometer.]

Serial No.	Equation.	Length.	Systematic correction.	Additional correction, adjustment of 1907.	Total correction, adjustment of 1907.	Total correction adopted 1907.*	Character of line.
		km.	mm.	mm.	mm.	mm.	
1	56	169			0.000	1899+.	
2	18A	186			-0.001	Eng.	
3	6B	78			-0.001	Eng.	
4	82	169			-0.003	G. S. 1905+.	
5	59	116			-0.004	1899+.	
6	16A	388			-0.003	-0.001 Eng., 1899+.	
7	40D	233			+0.005	-0.065 Water, Lake.	
8	81	80			-0.005	G. S. 1905+.	
9	39A	500			-0.005	-0.015 Water.	
10	36C	81			+0.006	+0.019 1899+.	
11	16B	86			-0.006	-0.008 Eng., 1899+.	
12	36H	128			-0.007	-0.013 1899+.	
13	36I	196			-0.008	-0.015 1899+.	
14	65	410			+0.009	-0.012 1899+.	
15	93	354			+0.010	G. S. 1905+.	
16	87	26			+0.012	1899+.	
17	36B	412			-0.013	-0.032 1899+.	
18	35C	131			-0.016	-0.063 1899+, Lake.	
19	16D	72			-0.017	-0.050 1899+.	
20	39C	850			+0.017	+0.049 Water.	
21	83	113			+0.017	G. S. 1905+.	
22	42A	260			+0.017	-0.009 Water, Lake.	
23	54C	87			+0.017	-0.007 1899+.	
24	64	755			-0.019	-0.008 1899+.	
25	22E	466			+0.021	1899+.	
26	35D	272			-0.021	-0.073 1899+.	
27	54B	116			+0.022	+0.006 1899+.	
28	52A	672			-0.022	-0.030 Lake, Eng. Wye., Water.	
29	51A	131			-0.023	-0.002 Lake.	
30	57	978			-0.024	1899+.	
31	40C	260			+0.025	+0.014 Water.	
32	58	2 315			+0.025	1899+.	
33	51B	181			-0.025	-0.011 Lake.	
34	41A	430			+0.026	+0.020 Water, Eng. Wye.	
35	91	251			-0.027	+0.074 Eng.	
36	1A	383			-0.028	Eng.	
37	68	610			-0.029	-0.043 1899+.	
38	18B	186			+0.029	Eng.	
39	18C	183			-0.030	Eng.	
40	40B	282			-0.032	-0.040 Water.	
41	79	158	+0.20	-0.16	+0.033	1899+.	
42	37E	40			+0.033	+0.090 Eng. Wye.	
43	92	287			+0.037	-0.181 Eng.	
44	77	272			+0.038	Eng. Wye.	
45	85	243			+0.040	-0.25 B. & O.	
46	36J	50			+0.044	+0.052 Geol.	
47	61	893			-0.048	1899+, Eng.	
48	63	478			+0.052	+0.11 Eng.	
49	28	330			-0.052	-1.1 Eng.	
50	75	111			+0.055	+0.68 Eng. Wye.	
51	62	720			-0.056	-0.11 Water, Eng.	
52	43B	131			+0.057	+0.082 Geol.	
53	50	260	+0.35	-0.29	+0.057	1899+.	
54	31	275			-0.060	-0.068 Eng.	
55	16C	86			+0.062	+0.034 Eng.	
56	6C	40			+0.062	Eng.	
57	78	222			+0.063	+0.055 Eng. Wye.	
58	61D	89			-0.063	Eng.	
59	39D	224			+0.065	-0.085 Eng.	
60	33B	68			+0.073	+0.032 Eng.	
61	38B	105			+0.079	+0.11 Lake.	
62	47J	18			+0.083	B. & O., 1899+.	
63	19	287			-0.087	Eng.	
64	43E	154			-0.087	-0.15 Geol.	
65	24	198	+0.14	-0.045	+0.091	+0.14 1899+.	
66	8A	147			-0.092	Eng.	
67	11A	79			-0.10	Eng.	
68	37C	170	+0.24	-0.35	-0.11	1899+.	
69	33A	541			+0.11	+0.10 Eng.	
70	9	197			+0.11	Eng.	
71	84	122			+0.12	Eng. Wye.	
72	44D	93			-0.12	-0.27 Geol.	
73	76	124			+0.16	Eng. Wye.	
74	36D	863			+0.16	+0.15 Geol.	

\* If no entry is made in this column, the adopted value is the same as the adjusted.

TABLE 3.—*Corrections to differences of elevation*—Continued.

[Corrections in millimeters per kilometer.]

Serial No.	Equation.	Length.	Systematic correction.	Additional correction, adjustment of 1907.	Total correction, adjustment of 1907.	Total correction adopted 1907.*	Character of line.
		km.	mm.	mm.	mm.	mm.	
75	5D.....	87			+0.17		Eng.
76	7B.....	106			-0.18		Eng.
77	73.....	74			+0.18	-1.4	B. & O.
78	53.....	320			+0.19	+0.20	Van O.
79	45B.....	271			+0.19	+0.22	P. R. R., Geol.
80	13A.....	301			-0.19		Eng.
81	43C.....	233			+0.19	+0.16	Geol., Water.
82	25.....	306			-0.20	-0.23	Eng.
83	60.....	479			-0.20		Eng.
84	4B.....	116			-0.20		Eng.
85	27.....	245			+0.21	+0.073	Eng.
86	40A.....	366			+0.21	+0.19	Lake, Water.
87	5B.....	140			+0.21		Eng.
88	6A.....	61			+0.22		Eng.
89	88.....	373			+0.22	+0.021	Water, Geol., B. & O.
90	7C.....	56			-0.22		Eng.
91	47I.....	96			+0.22		B. & O.
92	71.....	127			+0.22		B. & O.
93	47F.....	69			+0.22	+0.77	B. & O.
94	22A.....	23	+0.69	-0.45	+0.24		1899—
95	5C.....	315			+0.24		Eng.
96	43D.....	94			-0.26	-0.16	Geol.
97	22I.....	141	+0.28	-0.53	-0.26		1899—
98	43G.....	202			-0.26	-0.27	Geol., Lake.
99	15.....	312	+0.87	-1.1	-0.26	-0.23	1899—
100	80.....	158	+0.42	-0.69	-0.27	-0.28	1899—
101	10.....	34			+0.28		Eng.
102	22H.....	585	-0.14	-0.15	-0.29		1899—
103	74.....	207			-0.29	-0.66	1899+, B. & O.
104	43F.....	99			-0.31	-0.26	Geol.
105	46B.....	201			+0.33	+0.68	Geol.
106	45A.....	382			+0.33	+0.15	P. R. R.
107	12A.....	217	+0.64	-0.30	+0.34		1899—, Eng.
108	47H.....	48			-0.34	-1.1	B. & O.
109	47C.....	50	+0.092	-0.46	-0.37		1899—
110	17.....	181	+0.71	-0.33	+0.38		1899—
111	7A.....	15			-0.39		Eng.
112	90.....	108			-0.43		1899+, B. & O.
113	47G.....	89			+0.45		B. & O.
114	44A.....	166			-0.46	-0.41	Water, Geol.
115	44E.....	78			-0.46	-0.50	Geol.
116	86.....	71			+0.50	+0.53	B. & O.
117	55.....	293			-0.52	-0.52	Geol.
118	35E.....	329	+0.37	+0.16	+0.53	+0.53	1899—
119	48.....	119	+0.87	-0.33	+0.55		1899—
120	36G.....	671			-0.58	-0.67	Geol.
121	47D.....	90			+0.63		B. & O.
122	36F.....	120			-0.64	-0.64	Geol.
123	14A.....	224	+0.26	+0.50	+0.76		1899—
124	20.....	698	+0.67	-1.5	-0.81		1899—
125	44C.....	62			-0.82	-0.72	Geol.
126	26.....	205	+0.27	-1.1	-0.83	-0.99	1899—
127	47B.....	94	+0.21	-1.1	-0.85		1899—
128	22F.....	239	-0.29	-0.61	-0.90		1899—
129	43A.....	142			+0.92	+1.0	Geol., Water.
130	68.....	117			-0.97		B. & O.
131	22J.....	244	+0.16	+0.89	+1.0		1899—
132	89.....	94			+1.1		P. R. R.
133	44F.....	150			-1.1	-0.74	Geol.
134	22B.....	75	+0.49	-1.7	-1.2		1899—
135	67.....	116	+0.51	+0.69	+1.2		1899—
136	44B.....	86			-1.3	-1.0	Geol.
137	16.....	314	+1.1	+0.24	+1.4	+1.4	1899—
138	69.....	48	+0.29	+1.16	+1.4		1899—
139	29.....	151	+0.093	-1.6	-1.5	-1.4	1899—
140	49B.....	137	+0.64	+0.87	+1.5	+1.2	1899—
141	21.....	13	+1.4	+0.25	+1.6		1899—
142	30.....	265	+0.97	+0.69	+1.7	+1.5	1899—
143	23.....	45	+0.80	+0.93	+1.7		1899—
144	34.....	104	+0.24	+1.6	+1.8	+2.0	1899—
145	32.....	194	+1.1	+0.92	+2.1	+2.2	1899—
146	35F.....	85	+0.45	+1.7	+2.2		1899—
147	70.....	48			-2.5		B. & O.
148	72.....	103			-2.7		B. & O.

\* If no entry is made in this column, the adopted value is the same as the adjusted.

## ELEVATIONS.

The elevations in the following list supersede the elevations for the same bench marks published in Appendix 3, Report for 1903. The elevations of all bench marks not given in the following list are given in Appendix 3, Report for 1903. The index is meant to be a guide not only to the pages where the elevations and descriptions may be found, but to show definitely from which publications the elevations should be taken.

Nearly 3 000 of the elevations of bench marks published in 1903 are not changed. For the convenience of those who wish the information in that form, there is given below a list of the pages of Appendix 3, Report for 1903, where these elevations appear. All elevations on the page are unchanged unless otherwise stated.

*Pages of Appendix 3, Report for 1903, upon which unchanged elevations appear.*

## Page.

- 456.
- 457, first three bench marks.
- 459, from K<sub>2</sub> at St. Louis to XXVIII at Jefferson City, Mo., both inclusive.
- 463, I<sub>1</sub> at Biloxi, Miss., and following.
- 464, to and including P. B. M. 2 at Cairo, Ill.
- 468, four bench marks at Washington, D. C.; O at Richmond, Va., and following.
- 469, to and including B. M. Transit at Cedar Keys, Fla.
- 470, B. M. a at Annapolis, Md., and following.
- 471, all at Washington, D. C.
- 477, P. B. M. 1 at Birmingham, Ala., and following.
- 478.
- 479, to and including P. B. M. 6 at Demopolis, Ala.
- 480, P. B. M. 1 near Grafton, Ill., and following, except P. B. M. 3 at Grafton, which has been moved.
- 481, to and including P. B. M. 66, near Cairo, Ill.
- 483, P. B. M. 99, at Chicago, Ill., to P. B. M. XIII, except B. M. VI and B. M. VII.
- 500, 3 bench marks at and near Columbia Bottom.
- 501-505.
- 526, A at Newport, Ky., and following.
- 527-554.
- 555, to and including D. W. Castleton 5, near Castleton, N. Y.
- 558, 598 D at Dunkirk, N. Y., and following:
- 559.
- 560, to and including P. R. R. 100 at Pittsburg, Pa.
- 561, P. R. R. 88 at Braddock, and following.
- 562-567.
- 568, to and including Bridge 44, near New Berlin, Ohio.
- 573, H at Fruitland, Tex., and following.
- 574, first 5 bench marks at Fort Worth and M<sub>2</sub> at Fort Worth and following.
- 575, to and including W<sub>4</sub> at Holland, Tex.
- 580, 6 bench marks at Fort Hamilton.

Pages 568, after Monaca, Pa., 569, 570, and 571, to Lima, Ohio, are now rejected. In deriving the adopted elevations of the following list the same methods have been followed as were set forth on page 451 of Appendix 8, Report for 1899. The local differences of elevation as adopted, shown on pages 58 to 64 of this publication, have been preserved unchanged. The adopted elevations of the junction

points are shown on page 75, and in general the adoption of an elevation for each junction point fixes the elevations for a group of bench marks around it in accordance with the preceding sentence.

The elevations being thus fixed at each end of every line which forms a link in the level net, for intermediate points the corrections to the observed elevations have been interpolated between end points on the supposition that the correction varies at a uniform rate in millimeters per kilometer along the line except in two classes of cases, viz, first, if a line is composed of two classes of leveling which have been weighted differently, as indicated on page 72, the corrections have been supposed to vary on each part of the line at different rates in accordance with the assigned weights; second, if a bench mark is common to two or more lines between fixed points—as, for example, certain bench marks between Washington and Richmond which were connected with both the line of 1883-84 and of 1895—a mean or weighted mean of the two corrected elevations is taken as the adopted elevation. Such bench marks common to two lines serve to break both of them into sections, each of which, if it contains any intermediate bench marks, is treated as a link having fixed ends in deriving the elevations of these bench marks.

On each line which is a spur from the level net, or, in other words, is connected with it at one end only, a constant correction has been applied to the observed elevations equal to the correction applied at the origin of the spur.

The elevations are given in the following list to tenths of millimeters. This does not imply that the tenths are known. For bench marks not more than 2 kilometers apart the difference of elevation is uncertain in the millimeters and tenths; for those which are from 2 to 200 kilometers apart the centimeters are also uncertain, and for greater distances there may be in some cases an uncertainty in the decimeters. Similarly, the uncertainty in the absolute elevations varies with the distance from the nearest tidal connection.

For the convenience of those who may wish to compare the elevations here given with others which are expressed in feet, or vice versa, the following conversion table is here inserted:

Meters.	Feet.	Feet.	Meters.
1	3.280833	1	0.3048006
2	6.561667	2	0.6096012
3	9.842500	3	0.9144018
4	13.123333	4	1.2192024
5	16.404167	5	1.5240030
6	19.685000	6	1.8288037
7	22.965833	7	2.1336043
8	26.246667	8	2.4384049
9	29.527500	9	2.7432055
10	32.808333	10	3.0480061

## Corrected elevations of permanent bench marks.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
<i>meters.</i>			<i>meters.</i>		
Hunters Point, N. Y.	B. M. 39.	3.4959	Cornwall, W. Va.	No. XXXV.	211.3980
Near Metuchen, N. J.	No. IX.	25.4910	Near Cairo, W. Va.	No. XXXVI.	208.9885
South Plainfield, N. J.	No. X.	19.4604	Petroleum, W. Va.	No. XXXVII.	212.3433
Near Bound Brook, N. J.	No. XI.	9.8973	Near Petroleum, W. Va.	No. XXXVIII.	211.1976
Near New Market, N. J.	No. XII.	14.9856	Near Parkersburg, W. Va.	No. XXXIX.	185.0917
Bound Brook, N. J.	No. XIII.	10.8912	Parkersburg, W. Va.	O.	187.6390
Somerville, N. J.	No. XIV.	24.9333	Belpre, Ohio.	No. XL.	189.2904
Do.	G.	27.8233	Little Hocking, Ohio.	No. XLI.	190.0121
North Branch, N. J.	No. XV.	25.8718	Near Coolville, Ohio.	No. XLII.	193.0217
Near Annandale, N. J.	No. XVI.	108.2429	Do.	No. XLIII.	184.7558
Near Bloomsbury, N. J.	No. XVII.	99.4429	Near Stewart, Ohio.	No. XLVIII.	187.5582
Near Phillipsburg, N. J.	No. XVIII.	80.1708	Do.	No. XLVII.	187.8851
Easton, Pa.	No. XIX.	65.3588	Near Guysville, Ohio.	No. XLIV.	188.1670
Do.	No. XX.	108.8874	Do.	No. XLV.	189.5522
Do.	H.	110.8089	Near Canaanville, Ohio.	No. XLVI.	190.1247
Allentown, Pa.	I.	97.9050	Do.	No. XLIX.	192.1235
Near Allentown, Pa.	No. XXI.	90.1897	Athens, Ohio.	No. L.	197.8670
Near Macungie, Pa.	No. XXII.	116.9604	Do.	P.	199.9811
Near Shamrock, Pa.	No. XXIII.	129.3335	Moonville, Ohio.	No. LI.	217.0669
Reading, Pa.	J.	80.4680	Near Zaleski, Ohio.	No. LII.	217.7203
Near Robesonla, Pa.	No. XXIV.	131.8826	Near Hamden, Ohio.	No. LIII.	215.2492
Near Womelsdorf, Pa.	No. XXV.	147.3222	Near Londonderry, Ohio.	No. LIV.	183.0747
Lebanon, Pa.	No. XXVI.	144.6513	Near Schooley, Ohio.	No. LV.	200.4285
Do.	K.	141.9623	Chillicothe, Ohio.	Q.	194.4632
Near Annville, Pa.	No. XXVII.	123.5087	Near Musselmans Jet., Ohio.	No. LVI.	213.2525
Near Beaver, Pa.	No. XXVIII.	112.0629	Do.	No. LVII.	217.0747
Harrisburg, Pa.	No. XXIX.	108.7402	Near Lyndon, Ohio.	No. LVIII.	277.8778
Do.	L.	112.0339	Martinsville, Ohio.	No. LIX.	322.0562
Carlisle, Pa.	M.	144.2031	Near Clinton Valley, Ohio.	No. LX.	301.7670
Near Shippensburg, Pa.	No. XXX.	199.2696	Near Loveland, Ohio.	No. LXI.	211.2037
Chambersburg, Pa.	N.	189.1056	Loveland, Ohio.	R.	177.3580
Greencastle, Pa.	No. XXXI.	179.3464	Near Remington, Ohio.	No. LXII.	180.0947
Hagerstown, Md.	A.	168.2605	Near Cumminsville, Ohio.	No. LXIII.	154.3587
Near Hagerstown, Md.	No. I.	171.7790	Cincinnati, Ohio.	No. LXIV.	150.8206
Do.	No. II.	176.9417	Do.	S.	150.7190
Near Williamsport, Md.	No. IV.	150.7266	Do.	T or City B. M. No. 1.	166.5849
Do.	No. V.	136.3170	Near Delhi, Ohio.	No. LXV.	Destroyed
Williamsport, Md.	B.	109.0427	Near Lawrenceburg, Ind.	No. LXVI.	147.0438
Near Williamsport, Md.	C.	113.2730	Lawrenceburg, Ind.	U.	148.1154
Do.	No. VI.	113.1903	Near Cochran, Ind.	No. LXVII.	150.4423
Do.	D.	123.2130	Near Delaware, Ind.	No. LXVIII.	282.8577
Near Cherry Run, Md.	No. VII.	123.5896	Near North Vernon, Ind.	No. LXIX.	208.7748
Near Hancock, Md.	E.	123.3293	Near Medora, Ind.	V.	162.8065
Do.	No. VIII.	127.4749	Near Fort Rifter, Ind.	No. LXX.	159.0641
Hancock, Md.	F.	128.2339	Near Scottville, Ind.	W.	157.1176
Near Hancock, Md.	No. IX.	130.1720	Mitchell, Ind.	X.	209.4328
Do.	G.	135.2736	West Shoals, Ind.	Y.	159.2029
Do.	No. X.	137.6531	Washington, Ind.	Z.	155.2943
Near Little Orleans, Md.	No. XI.	139.6397	Vincennes, Ind.	A.	132.3163
Little Orleans, Md.	No. XII.	140.1122	Do.	No. I.	131.1211
Near Little Orleans, Md.	No. XIII.	142.5252	Olney, Ill.	B.	148.1688
Do.	H.	150.0559	Do.	No. II.	146.4290
Do.	No. XIV.	162.2627	Near Clay City, Ill.	No. III.	130.6559
Near Oldtown, Md.	No. XV.	164.7130	Flora, Ill.	C.	149.2996
Near Cumberland, Md.	No. XVI.	179.1239	Near Iuka, Ill.	No. IV.	143.6413
Cumberland, Md.	I.	190.1244	Salem, Ill.	D.	165.9112
Near Cumberland, Md.	No. XVII.	197.3259	Odin, Ill.	No. V.	160.8283
Do.	No. XVIII.	211.5291	Near Sandoval, Ill.	No. VI.	148.9400
Near Keyser, W. Va.	J.	244.7011	Near Collins, Ill.	No. VII.	136.1548
Bloomington, Md.	No. XX.	307.3909	Near Carlyle, Ill.	E.	133.7977
Near Bloomington, Md.	No. XXV.	663.3052	Carlyle, Ill.	F.	142.8180
Near Deer Park, Md.	No. XXIII.	748.5777	Near Aviston, Ill.	No. VIII.	137.9714
Near Oakland, Md.	No. XXII.	732.8395	Lebanon, Ill.	G.	139.4435
Do.	No. XXI.	724.9270	Near Caseyville, Ill.	No. IX.	137.0979
Do.	K.	724.0593	Near East St. Louis, Ill.	H.	158.9992
Near Hutton, Md.	No. XXIV.	741.9893	East St. Louis, Ill.	I.	126.1791
Near Cranberry Summit, W. Va.	No. XXVI.	756.1592	St. Louis, Mo.	J.	126.1814
Do.	No. XXVII.	747.5541	Do.	*K.	126.1776
Amblersburg, W. Va.	L.	464.8636	Near Cole, Mo.	No. XXXIX.	169.8080
Rowlesburg, W. Va.	No. XXVIII.	426.8224	Scott, Mo.	No. XXX.	177.1298
Near Rowlesburg, W. Va.	No. XXIX.	523.3291	Elston, Mo.	No. XXXI.	213.1941
Near Grafton, W. Va.	No. XXX.	311.9558	Centertown, Mo.	No. XXXII.	261.2173
Grafton, W. Va.	M.	303.6738	Do.	M. P. R. R. No. 114.	259.0199
Near Grafton, W. Va.	No. XXXI.	329.8212	California, Mo.	No. XXXIII.	267.1638
Near Bridgeport, W. Va.	No. XXXII.	298.4408	Do.	M. P. R. R. No. 122.	271.1734
Near West Union, W. Va.	No. XXXIII.	243.7785	Clarksburg, Mo.	No. XXXIV.	275.8022
West Union, W. Va.	N.	245.2057	Tipton, Mo.	No. XXXV.	282.1208
Near West Union, W. Va.	No. XXXIV.	244.5928			

\* Known also as St. Louis Directrix.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Fortuna, Mo.	No. 14.	295.7766	Wilson, Kans.	O.	515.2957
Near Versailles, Mo.	Versailles North Base.	322.4036	Do.	P.	515.6581
Do.	Hunter A.	319.5776	Dorrance, Kans.	Q.	528.0443
Near Syracuse, Mo.	No. XXXVI.	281.7723	Bunker Hill, Kans.	R.	569.0174
Near Otterville, Mo.	No. XXXVII.	223.5762	Do.	S, or Bunker Hill A.	570.2338
Do.	M. P. R. R. No. 143.	219.3314	Near Homer, Kans.	T, or Russell SE. Base.	573.2915
Near Smithton, Mo.	No. XXXVIII.	269.3200	Near Russell, Kans.	Russell NW. Base.	560.9522
Near Sedalia, Mo.	M. P. R. R. No. 152.	276.6457	Russell, Kans.	U.	558.9288
Sedalia, Mo.	No. XXXIX.	277.4905	Gorham, Kans.	V.	584.4583
Near Sedalia, Mo.	No. XL.	226.3619	Walker, Kans.	W.	593.6820
Lamonte, Mo.	No. XLI.	264.4892	Victoria, Kans.	X.	587.7328
Knobnoster, Mo.	No. XLII.	246.9910	Hays, Kans.	Y.	609.2408
Near Knobnoster, Mo.	M. P. R. R. No. 169.	226.9215	Ellis, Kans.	Z.	647.4570
Montserrat, Mo.	No. XLIII.	243.4952	Do.	A.	646.5641
Warrensburg, Mo.	No. XLIV or Normal A.	267.8863	Do.	B.	646.4418
Do.	No. XLV.	269.6727	Ogallah, Kans.	C.	724.7058
Center View, Mo.	No. XLVI.	266.0951	Wakeeney, Kans.	D.	751.3847
Holden, Mo.	No. XLVII.	260.4396	Collyer, Kans.	E.	787.2584
Near Holden, Mo.	No. XLVIII or M. P. R. R. No. 188.	244.4878	Quinter, Kans.	F.	816.8919
Kingsville, Mo.	No. XLIX.	279.9121	Buffalo Park, Kans.	G.	838.5749
Near Strasburg, Mo.	No. L.	255.5473	Grainfield, Kans.	H.	857.9262
Pleasant Hill, Mo.	No. LI.	261.3053	Grinnell, Kans.	I.	887.4582
Near Pleasant Hill, Mo.	M. P. R. R. No. 201.	260.7273	Oakley, Kans.	J.	930.4538
Do.	No. LII.	260.0923	Monument, Kans.	K.	967.1948
Near Greenwood, Mo.	M. P. R. R. No. 206.	280.3282	Near Page City, Kans.	L.	963.7183
Do.	No. LIII.	290.3219	Winona, Kans.	M.	1013.5756
Lees Summit, Mo.	No. LIV.	315.8242	McAllister, Kans.	N.	961.9399
Near Little Blue, Mo.	No. LV.	240.2246	Turkey Creek, Kans.	O.	965.0940
Near Independence, Mo.	No. LVI.	310.1773	Wallace, Kans.	P.	1010.2866
Independence, Mo.	No. LVII.	320.6280	Near Wallace, Kans.	Q.	1018.0642
Do.	City Directrix.	320.1120	Sharon Springs, Kans.	R.	1053.0077
Near Big Blue River, Mo.	No. LVIII.	228.1637	Monotony, Kans.	S.	1152.2197
Kansas City, Mo.	No. LIX.	228.2530	Weskan, Kans.	T.	1167.3059
Do.	Old M. R. C. B. M. 241.	228.2530	Near Weskan, Kans.	U.	1181.4783
Do.	Old M. R. C. B. M. 243.	230.3042	Arapahoe, Colo.	A.	1223.3815
Do.	Old M. R. C. B. M. 244.	230.1447	Cheyenne Wells, Colo.	B.	1305.1294
Do.	M. C. R. <sup>1</sup> / <sub>2</sub> , Top of Cap.	*228.7955	First View, Colo.	C.	1395.8619
Do.	Old M. R. C. B. M. 245.	227.5231	Kit Carson, Colo.	D.	1306.9273
Kansas City, Kans.	No. LIX.	228.3744	Near Wildhorse, Colo.	E.	1351.8322
Argentine, Kans.	No. LX.	229.2778	Aroya, Colo.	F.	1390.8729
Near Holliday, Kans.	No. LXI.	231.8842	Bovero, Colo.	G.	1444.9039
Do.	No. LXII.	233.0683	Mirage, Colo.	H.	1484.3879
Do.	No. LXIII.	233.0899	Hugo, Colo.	I.	1537.8403
Near Cedar Junction, Kans.	A.	238.5052	Do.	J.	1538.2071
Near Desoto, Kans.	B.	240.9929	Do.	K.	1558.2043
Desoto, Kans.	C.	243.4335	Near Lake, Colo.	L.	1596.4715
Near Weaver, Kans.	D.	243.9091	Lake, Colo.	M.	1615.9755
Near Eudora, Kans.	E.	247.3426	Limon, Colo.	N.	1632.0507
Lawrence, Kans.	F.	252.0127	Do.	O.	1639.0497
Do.	G.	249.2952	Do.	P.	1639.0367
Near Club House, Kans.	H.	252.9322	Resolis, Colo.	Q.	1699.9761
Near Leocompton, Kans.	I.	257.1890	Mattison, Colo.	R.	1764.8117
Do.	J.	258.1187	Ramah, Colo.	S.	1856.7197
Near Grover, Kans.	K.	261.5481	Calhan, Colo.	T.	1864.1318
Near Tecumseh, Kans.	L.	264.0926	Peyton, Colo.	U.	2073.8533
Topeka, Kans.	M.	270.9175	Falcon, Colo.	V.	2063.9906
Do.	B. M. Jennings.	283.2185	Do.	W.	2076.3982
Do.	O.	284.5609	Elsmere, Colo.	X.	1957.0978
Do.	N.	269.3143	Near Roswell, Colo.	Y.	1864.0128
Silver Lake, Kans.	P.	279.0259	Roswell, Colo.	Z.	1853.2044
Near Rossville, Kans.	Q.	283.5217	Colorado Springs, Colo.	A.	1825.0274
St. Marys, Kans.	R.	294.5140	Do.	B.	1822.9515
Near Belvue, Kans.	S.	293.2311	Do.	City B. M.	1822.6152
Warrego, Kans.	T.	302.2889	Do.	North Mast B. M.	1823.266
St. George, Kans.	U.	306.0634	Do.	South Mast B. M.	1822.963
Manhattan, Kans.	V.	307.0024	Do.	Nail B. M.	1822.394
Ogden, Kans.	W.	322.8398	Do.	Reference B. M.	1823.491
Fort Riley, Kans.	X.	326.3595	Do.	V. C. Post B. M.	1821.996
Junction City, Kans.	Y.	329.5044	Near Pike View, Colo.	C.	1894.8158
Near Chapman, Kans.	Z.	337.6456	Edgerton, Colo.	D.	1947.1158
Chapman, Kans.	A.	341.1600	Near Husted, Colo.	E.	1886.3886
Bavaria, Kans.	I.	388.7649	Husted, Colo.	F.	2007.1268
Brookville, Kans.	J.	414.5323	Monument, Colo.	G.	2121.1899
Near Terra Cotta, Kans.	K.	441.1316	Palmer Lake, Colo.	H.	2202.2623
Kanopolis, Kans.	L.	483.4536	Near Palmer Lake, Colo.	I.	2154.0837
Ellsworth, Kans.	M.	469.7150	Greenland, Colo.	J.	2100.9358
Do.	N.	469.6145	Larkspur, Colo.	K.	2035.6198
Do.	Water gauge B. M.	464.7638	Near Douglas, Colo.	L.	1923.2077
			Castle Rock, Colo.	M.	1890.5345
			Plateau, Colo.	N.	1832.7910

\*This elevation has been destroyed. For present elevation see page 102.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Sedalia, Colo.	O <sub>1</sub>	1780.0099	Atkins, Ark.	No. XIV	108.6465
Toluca, Colo.	P <sub>1</sub>	1710.9596	Galla Creek, Ark.	No. XV	113.3244
Near Acaquia, Colo.	Q <sub>1</sub>	1677.6364	Russellville, Ark.	No. XVI	106.9185
Wolhurst, Colo.	R <sub>1</sub>	1647.7243	Onita, Ark.	No. XVII	108.6146
Littleton, Colo.	S <sub>1</sub>	1634.5365	Near Onita, Ark.	No. XVIII	100.0021
Petersburg, Colo.	T <sub>1</sub>	1609.8335	Near Mill Creek, Ark.	No. XIX	99.4176
Denver, Colo.	U <sub>1</sub>	1608.9706	London, Ark.	No. XX	115.9316
Do.	V <sub>1</sub>	1608.7233	Near Berlin, Ark.	No. XXI	103.1984
Do.	W <sub>1</sub>	1609.0192	Knoxville, Ark.	No. XXII	120.6667
Do.	X <sub>1</sub>	1581.0823	Lamar, Ark.	No. XXIII	125.3392
Do.	Y <sub>1</sub>	1580.4641	Near Clarksville, Ark.	No. XXIV	114.6881
			Clarksville, Ark.	No. XXV	112.7526
River Bend, Colo.	N <sub>1</sub>	1675.1201	Do.	No. XXVI	112.3716
Godfrey, Colo.	M <sub>1</sub>	1705.2054	Spadra, Ark.	No. XXVII	115.2932
Agate, Colo.	L <sub>1</sub>	1664.3475	Hartman, Ark.	No. XXVIII	123.9839
Lowland, Colo.	K <sub>1</sub>	1621.2069	Coal Hill, Ark.	No. XXIX	144.6890
Deer Trail, Colo.	J <sub>1</sub>	1579.9133	Altus, Ark.	No. XXX	165.5420
Byers, Colo.	I <sub>1</sub>	1585.3637	Ozark, Ark.	No. XXXI	122.0446
Bennett, Colo.	H <sub>1</sub>	1671.5023	Poepping, Ark.	No. XXXII	116.9114
Watkins, Colo.	G <sub>1</sub>	1681.3357	White Oak, Ark.	No. XXXIII	120.9655
Near Magnolia, Colo.	F <sub>1</sub>	1672.5601	Near Mulberry, Ark.	No. XXXIV	117.3918
Do.	E <sub>1</sub>	1646.9176	Dyer, Ark.	No. XXXV	130.9705
Magnolia, Colo.	D <sub>1</sub>	1626.5250	Alma, Ark.	No. XXXVI	132.7619
Near Denver, Colo.	C <sub>1</sub>	1608.8640	Van Buren, Ark.	No. XXXVII	125.3907
Denver, Colo.	Z <sub>1</sub>	1585.6077	Do.	No. XXXVIII	126.4476
Jersey, Colo.	A <sub>1</sub>	1584.8873	Do.	No. XXXIX	126.4404
Do.	B <sub>1</sub>	1584.9233	Do.	No. XL	126.3970
			Fort Smith, Ark.	No. XLI	136.5967
Cairo, Ill.	P. B. M. 3.	99.7361	Do.	No. XLII	130.8053
Do.	P. B. M. 2.	97.3258	Near Little, Ark.	No. XLIII	141.1671
Do.	P. B. M. 1.	96.9227	Near Rudy, Ark.	No. XLIV	163.6491
Near Mound City Jct., Ill.	No. II.	99.7293	Near Lancaster, Ark.	No. XLV	185.5040
Mound City Junction, Ill.	No. I.	98.1723	Near Mountainburg, Ark.	No. XLVI	211.6920
Villa Ridge, Ill.	Z <sub>1</sub>	117.6242	Near Chester, Ark.	No. XLVII	249.8690
Do.	Y <sub>1</sub>	115.9443	Chester, Ark.	No. XLVIII	257.6375
Near Villa Ridge, Ill.	No. XII.	104.5941	Do.	No. XLIX	256.5017
Near Ullin, Ill.	No. 139.	102.3951	Porter, Ark.	No. CXXXVIII	331.0591
Do.	X <sub>1</sub>	102.8839	Near Winslow, Ark.	No. CXXXVII	572.0908
Anna, Ill.	W <sub>1</sub>	191.8478	Do.	No. CXXXVI	531.3241
Near Makanda, Ill.	V <sub>1</sub>	131.4888	Brentwood, Ark.	No. CXXXV	454.4139
Carbondale, Ill.	T <sub>1</sub>	126.6920	Near Woolseys, Ark.	No. CXXXIV	419.6893
Near De Soto, Ill.	U <sub>1</sub>	117.5531	West Fork, Ark.	No. CXXXIII	411.9454
Duquoin, Ill.	R <sub>1</sub>	140.9633	Greenland, Ark.	No. CXXXII	390.7762
Near Radom, Ill.	S <sub>1</sub>	152.3427	Fayetteville, Ark.	No. CXXXI	443.2392
Near Ashley, Ill.	Q <sub>1</sub>	170.3119	Johnson, Ark.	No. CXX	364.1219
Near Richview, Ill.	P <sub>1</sub>	165.8714	Springdale, Ark.	No. CXIX	405.2681
Centralia, Ill.	N <sub>1</sub>	160.7544	Lowell, Ark.	No. CXVIII	409.5438
Near Centralia, Ill.	O <sub>1</sub>	143.6484	Rogers, Ark.	No. CXVII	421.6241
Odin, Ill.	M <sub>1</sub>	161.1896	Avoca, Ark.	No. CXVI	415.1425
			Brightwater, Ark.	No. CXV	386.0605
Arkansas City, Ark.	F.	42.3343	Garfield, Ark.	No. CXIV	463.6741
Tillar, Ark.	H.	46.6718	Sellman, Mo.	No. CXIII	470.2523
Walnut Lake, Ark.	I.	49.9441	Washburn, Mo.	No. CXII	449.5612
Varner, Ark.	J.	54.6851	Exeter, Mo.	No. CXI	475.7883
Noble Lake, Ark.	K.	61.8032	Purdy, Mo.	No. CX	453.1326
Pine Bluff, Ark.	N.	68.4632	Monett, Mo.	No. CXIX	396.9967
Do.	L.	71.4879	Pierce City, Mo.	No. CVIII	366.5501
Near Pine Bluff, Ark.	E.	103.7691	Wentworth, Mo.	No. CVI	373.6666
Redfield, Ark.	D.	93.8562	Sarco, Mo.	No. CV	332.1081
Wrightsville, Ark.	C.	78.7039	Reeds, Mo.	No. CIV	343.7961
Near Wrightsville, Ark.	No. II.	81.2600	Carthage, Mo.	No. CIII	287.1223
Little Rock, Ark.	No. I or 3.	80.4742	Near Carthage, Mo.	No. CII	289.6411
Do.	A.	91.2080	Do.	No. CI	294.3830
Do.	B.	90.8052	Do.	No. C	280.8383
Do.	O.	87.9186	Jasper, Mo.	No. XCIX	289.2349
Argenta, Ark.	West Base.	78.1647	Boston, Mo.	No. XCVIII	287.8326
Near Little Rock, Ark.	No. I.	96.2758	Near Boston, Mo.	No. XCVII	283.8822
Marche, Ark.	No. II.	81.9652	Do.	No. XCVI	283.8814
Palarm, Ark.	No. III.	82.3295	Lamar, Mo.	No. XCV	298.7661
May Flower, Ark.	No. IV.	87.5968	Near Lamar, Mo.	No. XCIV	288.3535
Preston, Ark.	No. V.	84.0992	Irwin, Mo.	No. XCIII	296.9516
Conway, Ark.	No. VI.	97.7115	Sheldon, Mo.	No. XCII	281.9266
Near Conway, Ark.	No. VII.	100.7900	Milo, Mo.	No. XCI	268.1046
Near Menifee, Ark.	No. VIII.	86.5061	Nevada, Mo.	No. XC	262.8993
Menifee, Ark.	No. IX.	87.2741	Near Horton, Mo.	No. LXXXIX	228.1718
Plumerville, Ark.	No. X.	89.2098	Horton, Mo.	No. LXXXVIII	236.7270
Morrilton, Ark.	No. XI.	118.3766	Near Arthur, Mo.	No. LXXXVII	228.8555
Germantown, Ark.	No. XII.	93.5752	Rich Hill, Mo.	No. LXXXVI	245.6741
Blackville, Ark.	No. XIII.	99.3573	Do.	No. LXXXV	245.6680
			Near Rich Hill, Mo.	No. LXXXIV	231.8044
			Near Butler, Mo.	No. LXXXIII	231.6378
			Butler, Mo.	No. LXXXII	264.0126

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Passaic, Mo. ....	No. LXXXI	263.8847	Kleinston, Miss.	A. ....	28.7148
Adrian, Mo. ....	No. LXXX	264.6586	Vicksburg, Miss.	B. M. Cistern	59.0902
Near Archie, Mo. ....	No. LXXIX	243.0511	Do.	C. ....	62.8356
Archie, Mo. ....	No. LXXVIII	255.3318	Do.	D. ....	60.3439
Near Archie, Mo. ....	No. LXXVII	243.7999	Near Vicksburg, Miss.	E. ....	76.0361
Lone Tree, Mo. ....	No. LXXVI	268.1447	Do.	F. ....	80.1991
Harrisonville, Mo. ....	No. LXXV	275.5778	Newmans, Miss.	G. ....	100.9508
Do.	No. LXXIV	280.1950	Bovina, Miss.	H. ....	75.8977
Near Harrisonville, Mo.	No. 43*	309.6134	Near Bovina, Miss.	I. ....	46.5452
Near Pleasant Hill, Mo.	Big Creek	280.3160	Do.	J. ....	32.2696
			Smiths, Miss.	K. ....	41.1047
Kimpton, Mo. ....	No. LXXIII	309.1236	Edwards, Miss.	L. ....	68.9496
Coleman, Mo. ....	No. LXXII	310.4080	Near Edwards, Miss.	M. ....	52.7811
Raymore, Mo. ....	No. LXXI	336.9819	Near Bolton, Miss.	N. ....	62.2571
Belton, Mo. ....	No. LXX	337.4314	Near Clinton, Miss.	O. ....	101.8004
Near Newington, Kans.	No. LXXIX	265.4032	Jackson, Miss.	P. ....	90.7459
Morse, Kans. ....	No. LXXVIII	333.6556	Do.	Q. ....	84.0322
Olathe, Kans. ....	No. LXXVII	315.7496	Near Pearson, Miss.	R. ....	85.5705
Do.	No. LXXVI	315.8730	Greenfield, Miss.	S. ....	94.8711
Do.	No. LXXV	(†)	Brandon, Miss.	T. ....	121.0293
Near Holliday, Kans.	No. LXXIV	237.9067	Rankin, Miss.	U. ....	128.8637
			Peisahatchie, Miss.	W. ....	109.4163
			Near Clarksburg, Miss.	X. ....	113.3231
			Morton, Miss.	Y. ....	138.5631
			Forest, Miss.	Z. ....	140.7038
Delta, La. ....	No. 215.	28.0051	Lake, Miss.	A. ....	137.7059
Near Delta, La. ....	No. 211.	27.8908	Newton, Miss.	B. ....	129.3535
On Echo Plantation, La.	No. 207.	29.9035	Hickory, Miss.	C. ....	99.8896
On Duck Port Plantation, La.	No. 197.	29.7618	Chunkey, Miss.	D. ....	95.0647
On Cabin Teale Pl., La.	No. 188.	30.1997	Near Chunkey, Miss.	E. ....	90.8420
On River View Plantation, La.	No. 184.	28.9062	Graham, Miss.	F. ....	94.3557
Near Millikens Bend, La.	No. 179.	29.8558	Near Meridian, Miss.	G. ....	118.6897
Near Omega, La. ....	No. 171.	29.5612			
Near Hendersons Ldg., La.	No. 162.	31.1668	Chewalla, Tenn.	L. ....	125.9546
Do.	No. 161.	30.3588	Cypress Creek, Tenn.	M. ....	117.2030
Near Ingomar, Miss.	No. 153.	31.9579	Pocahontas, Tenn.	N. ....	122.1009
Do.	No. 150.	32.2921	Middleton, Tenn.	O. ....	125.2730
On Shiloh Plantation, Miss.	No. 140.	33.9458	Sauisbury, Tenn.	P. ....	165.5346
Near Hays, Miss. ....	No. 137.	32.4217	Grand Junction, Tenn.	R. ....	177.4412
Near Tallulah Ldg., Miss.	No. 128.	32.5371	La Grange, Tenn.	I. ....	162.6436
Do.	No. 124.	31.9422	Do.	K. ....	162.6757
On Ben Lomond Plantation, Miss.	No. 112.	33.4037	Moscow, Tenn.	H. ....	107.9260
On Reserve Plantation, Miss.	No. 105.	33.1944	Wolf River, Tenn.	G. ....	103.0697
Near Mayersville, Miss.	No. 95.	34.2591	Rossville, Tenn.	F. ....	94.5339
Do.	No. 90.	33.9762	Collerville, Tenn.	E. ....	117.9501
On Riverdale Plantation, Miss.	No. 83.	34.6396	Bailey, Tenn.	D. ....	109.0200
On Palmetto Plantation, Miss.	No. 70.	34.8962	Germanatown, Tenn.	C. ....	115.6531
Near Leota, Miss. ....	No. 65.	36.8795	White, Tenn.	B. ....	95.9311
Do.	No. 62.	36.7242	Buntyn, Tenn.	A. ....	91.7214
Near Lake Washington Landing, Miss.	No. 56.	36.0696	Memphis, Tenn.	P. B. M. Memphis	80.6435
On Longwood Plantation, Miss.	No. 46.	36.6764			
On Glenora Plantation, Miss.	No. 42.	36.7801	Washington, D. C.	H. ....	11.3616
On Auburn Plantation, Miss.	No. 39.	36.3000	Do.	I. ....	6.2859
Near Lake See, Miss.	No. 33.	37.1663			
Refuge, Miss. ....	No. 22.	39.7354	Mound, La. ....	P. B. M. 2.	25.4452
On Refuge Plantation, Miss.	No. 19.	39.9925	California, La.	P. B. M. 3.	26.9937
Warfield Point, Miss.	No. 11.	39.5569	Barnes, La.	P. B. M. 4.	24.8036
Near Warfield Point, Miss.	No. 8.	40.0149	Tallulah, La.	P. B. M. 5.	28.0877
Near Greenville, Miss.	No. 5.	39.3011	Do.	P. B. M. 6.	27.6918
Do.	No. 2.	40.5773	Near Lake One, La.	P. B. M. 7.	23.6685
Greenville, Miss.	Greenville No. 1.	40.0833	Quebec, La.	P. B. M. 8.	22.9896
			Near Quebec, La.	P. B. M. 9.	23.9224
			Dallas, La.	P. B. M. 10.	23.3359
			Waverly, La.	P. B. M. 11.	24.0452
			Near Bayou Maçon, La.	P. B. M. 12.	22.7288
			Delhi, La.	P. B. M. 13.	28.8544
			Carpenter, La.	P. B. M. 14.	26.4424
			Holly Ridge, La.	P. B. M. 15.	26.0183
			Rayville, La.	P. B. M. 16.	24.5926
			Do.	P. B. M. 17.	26.9220
			Near Rayville, La.	P. B. M. 18.	24.5012
			Girard, La.	P. B. M. 19.	24.2495
			Do.	P. B. M. 20.	26.3915
			Crew Lake, La.	P. B. M. 21.	20.3990
			Gordon, La.	P. B. M. 23.	19.7103

\* No description is furnished for No. 43, as it was only a temporary bench mark, but its elevation is necessary as a junction point.

† Destroyed.

‡ Destroyed. Reported 1903.



## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Monroe, La.	P. B. M. 24.	21.9144	Hamburg, La.	P. B. M. 87.	16.9721
Do.	P. B. M. 25.	24.7266	Near Simmesport, La.	P. B. M. 88.	15.3909
Do.	P. B. M. 26.	24.7754	Simmesport, La.	P. B. M. 89.	12.7835
Do.	P. B. M. 27.	23.8916	Near Water Valley Ldg., La.	P. B. M. 90.	13.0106
West Monroe, La.	P. B. M. 28.	23.1448	Near Merrick, La.	P. B. M. 91.	13.5759
Chênère, La.	P. B. M. 29.	27.4188	Near Barbree Landing, La.	P. B. M. 92.	13.6589
Calhoun, La.	P. B. M. 30.	50.5493	Do.	P. B. M. 93.	15.1812
Choudrant, La.	P. B. M. 32.	46.5164	Do.	P. B. M. 94.	15.3815
Ruston, La.	P. B. M. 33.	95.9471	Near Smithland, La.	M. R. C. 1 <sup>st</sup> .	14.1806
Near Ruston, La.	T. B. M. 72a=V. S. & P. R. R.	74.4242			
Do.	V. S. & P. R. R.	73.6108	Delhi, La.	T. B. M. 1.	29.4991
Allen Green, La.	P. B. M. 34.	100.7331	Near Pullaway Ldg., La.	P. B. M. Griffin.	26.6400
Simmsboro, La.	P. B. M. 35.	97.7274	Sunrise Landing, La.	P. R. P. Newcomer.	28.1159
Arcadia, La.	P. B. M. 36.	112.5607	Near Crowville, La.	P. B. M. Gray.	23.0498
Gibbsland, La.	P. B. M. 37.	73.8338			
Taylor, La.	P. B. M. 38.	66.6181	Albany Pt., La.	P. B. M. 1.	68.0064
Near Dubberly, La.	T. B. M. 91a=V. S. & P. R. R.	81.9336	Hendersons Mill, La.	P. B. M. 2.	74.5544
Dubberly, La.	P. B. M. 39.	78.0987	Mooringport, La.	P. B. M. 3.	55.9654
Sibley, La.	P. B. M. 40.	57.6869	Jeters Landing, La.	P. B. M. 4.	60.1967
Bayou Dorcheat, La.	P. B. M. 41.	43.0351			
Doyle, La.	P. B. M. 42.	68.1228	Monroe, La.	B. M. C (Burrowes, 1833).	24.7670
Haughton, La.	P. B. M. 43.	72.2461	Do.	B. M. D (Burrowes, 1833).	24.6136
Bodcau, La.	P. B. M. 44.	62.1721	Logtown, La.	P. B. M. 9.	21.7722
Shreveport, La.	P. B. M. 46.	59.7386	Blankston, La.	P. B. M. 10.	19.0875
Near Shreveport, La.	P. B. M. 47.	50.0203	Near Waverly, La.	T. B. M. 125.	21.7082
Shreveport, La.	T. B. M. 116a.	56.8450	Near Riverton, La.	P. B. M. 11.	19.3449
Do.	Mark for barometer.	60.7388	Do.	Gauge B. M. B.	23.5090
Do.	Bayou Pierre B. M. 2.	55.4884	Riverton, La.	Gauge B. M. A.	17.2477
Do.	T. B. M. 121=Δ 148.	51.1880	Columbia, La.	P. B. M. 12.	18.7942
Lotus Landing, La.	P. B. M. 48.	43.1186	Near Columbia, La.	T. B. M. 137.	18.2787
On Cash Plantation, La.	P. B. M. 49.	46.4853	Gibsons Landing, La.	F. R. P. Gibson.	18.7661
Caspiana Landing, La.	P. B. M. 50.	45.2202	Coles Landing, La.	P. B. M. 13.	18.5572
On Campo Bello Plantation, La.	P. B. M. 51.	44.6988	Cottingham Landing, La.	P. B. M. 14.	17.7321
On Bonner's Plantation, La.	P. B. M. 52.	43.9598	Danville, La.	B. M. B.	18.4510
Near Howard, La.	P. B. M. 53.	43.1547	Near Danville, La.	B. M. A.	18.3621
Near Loggy Bayou, La.	P. B. M. 54.	43.8857	Stafford, La.	F. B. M. 8.	17.2770
Eastpoint, La.	P. B. M. 55.	* 43.2700	Catahoula Shoals, La.	P. B. M. 7.	17.5290
On Crichton's Plantation, La.	P. B. M. 56.	42.0416	Harrisonburg, La.	T. B. M. H.	18.4760
Coushatta, La.	P. B. M. 57.	40.3631	Do.	B. M. V.	20.6333
Do.	P. B. M. 58.	40.7872	Do.	P. B. M. 6.	24.1991
On Upper Brownsville Plantation, La.	P. B. M. 59.	38.5882	Trinity, La.	P. B. M. 5.	16.4408
Near Old River, La.	P. B. M. 60.	36.9792	Jonesville, La.	P. B. M. 4.	16.5610
Near Campiti, La.	P. B. M. 61.	† 36.2499			
Near Willow, La.	P. B. M. 62.	36.3232	Jones Bayou, La.	P. B. M. 5 a.	18.0566
Near Tiger Island, La.	P. B. M. 63.	34.4222	McClures Landing, La.	P. B. M. 6 a.	17.0935
St. Maurice, La.	P. B. M. 64.	32.8635	Eva, La.	P. B. M. 7 a.	16.4322
Near Dunns Landing, La.	P. B. M. 65.	31.9658	Hardscramble Landing, La.	P. B. M. 8 a.	16.6309
Near Montgomery, La.	P. B. M. 66.	30.2658	Lums, La.	P. B. M. 9 a.	16.0348
Buxtons Landing, La.	P. B. M. 67.	28.1493	New Era, La.	P. B. M. 10 a.	15.9470
Near Colfax, La.	P. B. M. 68.	26.4253	Acme, La.	P. B. M. 11 a.	15.4078
Colfax, La.	P. B. M. 69.	29.3467	Near Acme, La.	Discharge Jar.	15.5692
Near Fairmount, La.	P. B. M. 70.	28.8471	Do.	P. B. M. 12 a.	15.0302
Boyce, La.	P. B. M. 71.	26.1913	Near Murrays Landing, La.	P. B. M. White.	16.6033
Near Rapides, La.	P. B. M. 72.	23.9311	Barbin Landing, La.	P. B. M. Barbin.	17.6731
Alexandria, La.	P. B. M. 73.	22.4791			
Do.	P. B. M. 74.	21.6317	Black River, La.	P. B. M. 3.	15.7061
Do.	B. M. 3 (Merrill, 1871).	24.3120	Frogmore, La.	P. B. M. 2.	17.2984
Do.	B. M. 4 (Merrill, 1871).	24.0498	Concordia, La.	T. B. M. 9.	19.7000
Near Alexandria, La.	P. B. M. 75.	22.1087	Vidalia, La.	M. R. C. Stone 1 <sup>st</sup> .	17.7806
Near Grand Bend, La.	P. B. M. 76.	21.6797	Do.	B. M. 1858.	19.6762
Near Jones Quarter Landing, La.	P. B. M. 77.	20.2192	Do.	B. M. C. H. Pedestal.	20.3346
Near Poland, La.	P. B. M. 78.	18.5551	Natchez, Miss.	B. M. Polk 1.	23.4782
Near Egg Bend Ldg., La.	T. B. M. 23=Δ 362.	19.3732	Do.	B. M. Polk 2.	25.1330
Egg Bend Landing, La.	P. B. M. 79.	† 18.7503	Do.	B. M. Polk 3.	12.3898
David Ferry, La.	P. B. M. 80.	20.2290	Do.	B. M. cor. of State and Broadway sts.	59.4351
Normands Landing, La.	P. B. M. 81.	18.7573	Do.	B. M. No. 7 (Melvin, 1879).	65.8598
Do.	P. B. M. 82.	18.8388			
Near Barbin Landing, La.	T. B. M. 53.	24.1793	Burke, La.	P. B. M. Burke.	23.1699
Marksville, La.	P. B. M. 83.	26.6752	Archibald, La.	P. B. M. Archibald.	23.5477
Mansura, La.	P. B. M. 84.	23.2926			
Do.	P. B. M. 85.	24.2872			
Moreauville, La.	P. B. M. 86.	18.6680			

\* Reported destroyed.

† Reported destroyed, 1892.

‡ Destroyed.

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Mangham, La. ....	P. B. M. Mangham ..	22.8657	Camden, Ark. ....	P. B. M. Camden III..	32.9333
Big Creek, La. ....	P. B. M. Big Creek ..	22.7936	Do. ....	P. B. M. Camden II..	60.8666
Baskin, La. ....	P. B. M. Baskin. ....	22.5995	Do. ....	P. B. M. Camden I..	42.3375
Steeles Switch, La. ....	P. B. M. Steele. ....	22.1394	Lester, Ark. ....	P. B. M. Lester. ....	34.7933
Winnsboro, La. ....	P. B. M. Winnsboro..	22.1109	Chidester, Ark. ....	P. B. M. Chidester ..	70.3330
Eden, La. ....	P. B. M. Eden. ....	21.9672	Little Missouri River, Ark.	P. B. M. Little Missouri	50.6513
Gilbert, La. ....	P. B. M. Gilbert. ....	23.8222	Whelen, Ark. ....	P. B. M. Whelen. ....	77.0376
Wisner, La. ....	P. B. M. Wisner. ....	22.9085	Gurdon, Ark. ....	P. B. M. Gurdon II..	63.6214
Elam, La. ....	P. B. M. Elam. ....	22.1365	Do. ....	P. B. M. Gurdon I..	63.7728
Peck, La. ....	P. B. M. Peck. ....	22.9244	Near Smithton, Ark. ....	P. B. M. Smithton. ....	62.9812
Near Peck, La. ....	P. B. M. Newman. ....	21.8917	Curtis, Ark. ....	P. B. M. Curtis. ....	56.5404
Near Florence, La. ....	P. B. M. Chisum. ....	21.9945	Gum Springs, Ark. ....	P. B. M. Gum Springs.	65.3187
Florence, La. ....	P. B. M. Florence. ....	22.1883	Arkadelphia, Ark. ....	P. B. M. Arkadelphia	66.0181
Copeland, La. ....	P. B. M. Copeland. ....	19.6552	Do. ....	II.	
Kirks Ferry, La. ....	P. B. M. Kirk. ....	19.9292	Do. ....	P. B. M. Arkadelphia I.	57.5249
Greenville, La. ....	P. B. M. Tensas. ....	19.7858	Near Arkadelphia, Ark. ....	Gauge B. M. B.	56.8715
Lee Bayou, La. ....	P. B. M. Lee Bayou. ....	19.4536	Do. ....	(Ewens, 189-).	
Clayton, La. ....	P. B. M. Clayton. ....	18.8284	Do. ....	P. B. M. Ouachita	59.5269
Cypress City, La. ....	P. B. M. Cypress. ....	17.8863	River.		
Helena, La. ....	P. B. M. Helena. ....	18.5439	Daleville, Ark. ....	P. B. M. Daleville. ....	57.1233
Concordia, La. ....	P. B. M. Concordia. ....	18.5234	Donaldson, Ark. ....	P. B. M. Donaldson. ....	69.7484
Do. ....	B. M. 384. ....	20.9115	Malvern, Ark. ....	P. B. M. Malvern. ....	82.6401
Osbornes Ferry, La. ....	P. R. P. Osborne. ....	23.9543	Traskwood, Ark. ....	P. B. M. Traskwood. ....	89.1059
New Light, La. ....	P. B. M. New Light..	21.9848	Saline River, Ark. ....	P. B. M. Saline River.	86.1843
Alto, La. ....	P. R. P. Alto. ....	22.6697	Benton, Ark. ....	P. B. M. Benton. ....	91.0747
Near Charleville, La. ....	P. B. M. Harland. ....	22.6387	Alexander, Ark. ....	P. B. M. Alexander. ....	99.5725
Do. ....	P. A. P. Stokes. ....	22.1533	Mabelvale, Ark. ....	P. B. M. Mabelvale. ....	94.6353
Do. ....	P. R. P. Stokes. ....	22.2023	Ensign, Ark. ....	P. B. M. Ensign. ....	89.5277
Holly Grove Ldg., La. ....	P. R. P. Hatch. ....	21.5031	Little Rock, Ark. ....	T. B. M. 2. ....	80.2505
Near Holly Grove, La. ....	P. R. P. Noble 2. ....	20.7299	Do. ....	B. M. Whittemore. ....	80.4622
Near Landerneau, La. ....	P. R. P. Elmore. ....	20.3684	Do. ....	B. M. Abert. ....	75.2599
Do. ....	P. R. P. Doucier. ....	20.9760	Do. ....	B. M. Merrill. ....	78.0963
Near Boeuf River, La. ....	P. R. P. Harris. ....	19.9431	Do. ....	S. S. Gauge B. M.	75.9594
Do. ....	P. R. P. Wheeler. ....	19.9726	Do. ....	B. M. State House	87.9219
Do. ....	P. R. P. Herbert. ....	19.1777	Do. ....	Steps.	
Do. ....	P. R. P. LaFourche. ....	19.0079	Do. ....	Gauge B. M. A.	73.8702
Near Columbia, La. ....	P. R. P. Columbia. ....	20.9551	Do. ....	(Ewens).	
Do. ....	P. R. P. Wade. ....	21.2685	Do. ....	B. M. 1 (Ewens, 1887)..	72.1045
Do. ....	P. R. P. Three Rivers.	16.7154	Do. ....	No. 6 (Gauge B. M.).	80.1983
Near Bayou Stord, La. ....	P. R. P. Pargoud. ....	31.6034	Glendora, La. ....	T. B. M. 79. ....	26.1581
Bank Smith Place, La. ....	P. R. P. Zeph. ....	24.1833	Port Union Landing, La. ....	P. B. M. Port Union..	25.8971
Rock Row Shoals, La. ....	P. R. P. Rock Row. ....	23.4547	Near Point Pleasant, La. ....	P. B. M. Hay. ....	41.3214
Near Glendora, La. ....	P. R. P. Glendora. ....	24.8319	Near Farmerville, La. ....	P. B. M. White. ....	54.6941
Parkeville, La. ....	P. R. P. Parkeville. ....	23.6637	Do. ....	P. B. M. Rogers. ....	53.5738
Near Mill Bayou, La. ....	P. R. P. Cashill. ....	21.8752	Farmerville, La. ....	P. B. M. Farmerville. ....	54.8200
Near Fishtrap Shoals, La. ....	P. R. P. Fishtrap. ....	21.3023	Scotts Bluff, La. ....	P. B. M. Scott. ....	23.2386
Alabama Landing, La. ....	P. R. P. Alabama. ....	21.2923	Steins Bluff, La. ....	P. B. M. Stein. ....	29.5587
Frank Pierre Creek, La. ....	P. R. P. Frank Pierre.	17.1314	Near Bayou D'Arbonne, La.	P. B. M. Cox Ferry...	21.6344
Near Shiloh Shoals, La. ....	P. R. P. Shiloh. ....	17.3810	Buena Vista, Ark. ....	H. S. 287. ....	87.7834
Near Lake Landing, Ark. ....	P. R. P. Lake. ....	18.0963	Do. ....	P. B. M. Buena Vista.	86.1346
Near Bayou Lapile, Ark. ....	P. R. P. Lapile. ....	18.8178	Near Ogama, Ark. ....	R. R. B. M. ....	57.0875
Near Ouachita Belle Land- ing, Ark. ....	P. R. P. Belle Point..	19.6984	Stephens, Ark. ....	P. B. M. Stephens. ....	71.9491
Near Belle Point Ldg., Ark.	T. B. M. 39. ....	20.7942	Near Stephens, Ark. ....	R. R. B. M. ....	56.2515
Near Eutaw Shoals, Ark. ....	P. R. P. Eutaw. ....	22.1688	McNeil, Ark. ....	P. B. M. McNeil. ....	98.3571
Near Jacks Island, Ark. ....	P. R. P. Jacks Island.	23.8691	Waldo, Ark. ....	P. B. M. Waldo. ....	107.4186
Careyville Landing, Ark. ....	P. R. P. Careyville. ....	25.1057	Near Buckner, Ark. ....	R. R. B. M. ....	75.5707
Pigeon Hill Landing, Ark. ....	P. R. P. Pigeon Hill..	27.9049	Stamps, Ark. ....	P. B. M. Stamp. ....	81.5629
Near Fletchers Ldg., Ark. ....	P. R. P. Fletcher. ....	25.8091	New Lewisville, Ark. ....	P. B. M. Lewisville. ....	79.3230
Near Franklin Bayou, Ark. ....	P. R. P. Franklin. ....	22.7361	Lewisville, Ark. ....	T. B. M. 239. ....	83.8798
Near Champagnolle Ldg., Ark.	P. R. P. Bell Field. ....	24.7572	Garland, Ark. ....	P. B. M. Garland. ....	70.6515
El Dorado Landing, Ark. ....	P. R. P. Champagnolle	29.8024	Do. ....	Red River Survey, B.	70.4388
Near Smackover Crk., Ark. ....	P. R. P. El Dorado. ....	26.9154	Jordan Ferry, Ark. ....	M. 4. ....	
Leppards Camp, Ark. ....	P. R. P. Smackover. ....	26.4756	Jordan Landing, Ark. ....	P. B. M. Jordan. ....	65.8153
Near Little Bay, Ark. ....	P. R. P. Leppard. ....	27.6780	Do. ....	Red River Survey, P.	65.9075
Near Beech Hill, Ark. ....	P. R. P. Little Bay. ....	27.6771	Canfield, Ark. ....	R. P. 14. ....	
Near Walnut Hill, Ark. ....	P. R. P. Beech Hill..	28.4462	Bradley, Ark. ....	P. B. M. Canfield. ....	78.9533
Do. ....	P. R. P. Walnut Hill.	27.6323	Millers Bluff, La. ....	P. B. M. Bradley. ....	77.0750
Do. ....	T. B. M. 5. ....	31.7488	Near Millers Bluff, La. ....	P. B. M. Lusk. ....	69.9644
Frenchport, Ark. ....	P. R. P. Frenchport II.	37.6054	Do. ....	Red River Survey, P.	60.5505
Do. ....	P. R. P. Frenchport I.	34.8649	Do. ....	R. P. 25. ....	
Elliott, Ark. ....	P. R. P. Elliott. ....	77.5495	Plain Dealing, La. ....	P. B. M. Plain Deal- ing.	79.4974
Camden, Ark. ....	Gauge B. M. A. ....	40.8101	Alden Bridge, La. ....	P. B. M. Alden Bridge.	65.8141
Near Camden, Ark. ....	(Ewens, 1890).		Hurricane Bluff, La. ....	P. B. M. Hurricane	58.4927
	P. B. M. Camden IV..	35.1840	Bluff.		
			Near Hurricane Bluff, La.	Red River Survey, P.	69.8629
				R. P. 30C.	

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		meters.			meters.
Benton, La.	P. B. M. Benton	64.1520	Indianola, Miss.	P. B. M. 17.	35.8539
Near Vanceville, La.	T. B. M. 274.	54.3179	Heathman, Miss.	P. B. M. 16.	37.0615
Do.	Red River Survey, P. R. P. 32.	55.5180	The Bogue, Miss.	P. B. M. 15.	35.0528
Near Shreveport, La.	P. B. M. 45.	52.2723	Stoneville, Miss.	P. B. M. 14.	37.3410
Shreveport, La.	B. M. "B. P."	56.9176			
Parkeville, La.	T. B. M. 74.	24.8857	Greenville, Miss.	Greenville North Base.	38.4728
On Bayou Bartholomew, La.	P. B. M. Sandidge.	27.2771	Near Argyle, Miss.	P. B. M. 88.	38.2228
Do.	P. B. M. Myers.	27.7620	Millers Bend, Miss.	P. B. M. 87.	39.5153
Do.	P. B. M. Williams.	26.5246	Near Offutt's Landing, Miss.	P. B. M. 86.	41.2674
Do.	P. B. M. Anderson.	27.6177	Port Anderson, Miss.	P. B. M. 85.	41.7485
Do.	P. B. M. Bonner.	28.0917	Wilkersons Landing, Miss.	P. B. M. 84.	42.3907
Do.	P. B. M. Davis No. 2.	29.2882	Near Wilkersons Landing, Miss.	P. B. M. 83.	42.4335
On Bayou Bartholomew, Ark.	P. B. M. Noble.	34.8002	Mound Place, Miss.	P. B. M. 82.	42.3651
Wards Ferry, La.	P. B. M. Ward.	29.7133	Childers, Miss.	P. B. M. 81.	42.8107
Near Bayou Bartholomew, La.	P. B. M. Wells.	30.5732	Content, Miss.	P. B. M. 80.	43.6768
Mound Landing, La.	P. B. M. Mound.	31.2994	Buck Ridge, Miss.	P. B. M. 79.	43.2399
Lindgrove Landing, La.	P. B. M. Lindgrove.	32.3180	Bolivar, Miss.	P. B. M. 78.	42.9919
Bonita, La.	P. B. M. Bonita.	32.5241	Stormville, Miss.	P. B. M. 77.	43.3601
Jones, La.	P. B. M. Jones.	32.6471	Nebetts Landing, Miss.	P. B. M. 76.	44.3402
Near Jones, La.	P. B. M. Louisiana.	32.7593	Near Prentiss, Miss.	P. B. M. 75.	45.3840
Arkansas.			Do.	P. B. M. 74.	45.2692
Wilnot, Ark.	P. B. M. Wilnot.	34.9825	Do.	P. B. M. 73.	44.7769
Parkdale, Ark.	P. B. M. Parkdale.	35.6087	Near Clarks Landing, Miss.	P. B. M. 72.	45.2679
Sunshine, Ark.	P. B. M. Sunshine.	36.0620	Near Beulah, Miss.	P. B. M. 71.	44.6054
Portland, Ark.	P. B. M. Portland.	38.9725	Riverton, Miss.	P. B. M. 70.	45.8312
Kidds Spur, Ark.	P. B. M. Kldd.	37.9943	Rosedale, Miss.	P. B. M. 69.	46.2366
Morrell, Ark.	P. B. M. Morrell.	39.7829	Do.	P. B. M. 68.	44.8319
Hudspeth, Ark.	P. B. M. Hudspeth.	40.6476	Near Terrene, Miss.	P. B. M. 67.	47.3121
Dermott, Ark.	P. B. M. Dermott.	42.7988	Near Concordia, Miss.	P. B. M. 66.	47.2679
Baxter, Ark.	P. B. M. Baxter.	43.3323	Concordia, Miss.	P. B. M. 65.	48.2778
McGehee, Ark.	G.	45.7196	Carsons, Miss.	P. B. M. 64.	49.2104
Do.	P. B. M. McGehee.	45.3977	Near Australia, Miss.	P. B. M. 63.	49.4465
Tripp Junction, Ark.	P. B. M. Tripp.	44.1821	Lake Charles Landing, Miss.	P. B. M. 62.	50.5451
Do.	T. B. M. 117—Levee	44.1971	Robinsonville, Miss.	P. B. M. 61.	49.4026
Near Arkansas City, Ark.	B. M.		Near Sunflower Ldg., Miss.	P. B. M. 60.	51.3951
Near Wilkersons Ldg., Miss.	M. R. C. Stone #2.	41.5920	Near Hughes Landing, Miss.	P. B. M. 59.	53.0779
	M. R. C. Stone #1.	44.2756	Do.	P. B. M. 58.	52.3941
			Near Friar Point, Miss.	P. B. M. 57.	52.2886
			Friar Point, Miss.	P. B. M. Friar Point II.	55.2759
			Do.	P. B. M. Friar Point I.	55.9050
Near Port Anderson, Miss.	T. B. M. 121—Levee	44.2099	Near Friar Point, Miss.	B. M. Delta.	54.7774
Millers Bend, Miss.	Board B. M.	38.8019	Glendale, Miss.	B. M. Glendale.	56.3359
Greenville, Miss.	P. B. M. Millers Bend.	38.2266	Helena, Ark.	B. M. Helena I.	58.6152
	B. M. O.		Do.	B. M. Helena II.	58.6217
Vicksburg, Miss.	P. B. M. 1.	31.4877	Near Austin, Miss.	B. M. Trotters Land- ing.	56.4471
Near Vicksburg, Miss.	P. B. M. 2.	29.5587	Austin, Miss.	B. M. Austin I.	60.0037
Do.	T. B. M. 11.	29.2614	Do.	B. M. Austin II.	59.3311
On Belle Isle Plantation, Miss.	P. B. M. 6.	28.5160	Mhoons Landing, Miss.	B. M. Mhoons Ldg.	59.3333
On Blakely Plantation, Miss.	P. B. M. 3.	34.5474	Commerce, Miss.	B. M. Commerce.	60.0509
Yazoo River, Miss.	P. B. M. 4.	28.8283	Star Landing, Miss.	B. M. Star Landing.	63.1209
Do.	P. B. M. 5.	32.2515	Horn Lake Creek, Miss.	B. M. Horn Lake Creek.	67.2289
Calmar, Miss.	P. B. M. 7.	31.1642			
Near L'Argent, Miss.	P. B. M. 8.	28.9214	Friar Point, Miss.	P. B. M. Friar Pt. III.	53.8212
L'Argent, Miss.	P. B. M. 9.	26.9799	Coahoma, Miss.	P. B. M. Coahoma.	54.2468
Satartia, Miss.	P. B. M. 10.	29.7517	Near Clover Hill, Miss.	P. B. M. Clover Hill.	52.8609
Enola, Miss.	P. B. M. 11.	30.4046	Lyon, Miss.	P. B. M. Lyon.	53.0236
Yazoo City, Miss.	P. B. M. 12.	35.8723	Clarksdale, Miss.	P. B. M. Clarksdale I.	52.9762
Do.	P. B. M. 13.	31.3297	Do.	P. B. M. Clarksdale II.	52.5975
Bee Lake, Miss.	P. B. M. 29.	32.9303	Near Clarksdale, Miss.	P. B. M. Clarksdale III.	52.7129
Tchula, Miss.	P. B. M. 28.	36.0737			
Do.	P. B. M. 27.	34.9116	Near Ocean Springs, Miss.	P. B. M. Keenor.	5.5162
Sidon, Miss.	P. B. M. 26.	37.3472	Top of cap over same.		6.7295
Greenwood, Miss.	P. B. M. 25.	38.2179	Near Biloxi, Miss.	Biloxi Gauge B.	1.6963
Do.	P. B. M. 24.	39.4141	Do.	P. B. M. 19A.	1.7356
Fort Loring, Miss.	P. B. M. 23.	41.0264	Biloxi, Miss.	T. B. M. 184.	5.3620
Do.	P. B. M. 22.	39.1682	Do.	P. B. M. City Hall.	7.0227
Itta Bena, Miss.	P. B. M. 21.	38.1557	Do.	T. B. M. 183.	7.1855
Near Baird, Miss.	P. B. M. 20.	35.7698	Do.	T. B. M. 186.	7.2558
Do.	P. B. M. 19.	35.0423	Do.	P. B. M. Hygela.	6.5078
Do.	P. B. M. 18.	38.5872	Do.	Top of cap over same.	7.7212

\* Reported destroyed, 1897.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		meters.			meters.
Beauvoir, Miss.	P. B. M. 17.	7.8644	Near Burtville, La.	B. M. 11 <sup>a</sup>	5.9304
Mississippi City, Miss.	P. B. M. 16.	6.3600	Near Baton Rouge, La.	P. B. M. XXIX.	8.4054
White Harbor, Miss.	P. B. M. 14.	9.4063	Do.	Top of cap over same.	9.6226
Pass Christian, Miss.	P. B. M. 13.	3.3683	Do.	P. B. M. XXVIII.	9.2825
Bay St. Louis, Miss.	P. B. M. 11.	6.5203	Do.	P. B. M. XXX.	8.9429
Do.	P. B. M. 10.	7.1720	Baton Rouge, La.	P. B. M. City Limits.	9.3068
Waveland, Miss.	P. B. M. 9.	4.7218	Do.	U. S. E. 2.	10.4616
Chinchuba, Miss.	P. B. M. 8.	2.9582	Do.	T. B. M. 1.	18.4070
Claiborne, Miss.	P. B. M. 7.	1.2668	Do.	P. B. M. XXXI.	18.9426
Near Claiborne, Miss.	P. B. M. 6.	3.1326	Do.	P. B. M. Barracks.	17.8250
Fort Macomb, Chef Men-	P. B. M. 4.	2.2206	Do.	T. B. M. 2.	17.1428
teur, La.			Do.	P. B. M. Post-Office.	18.0000
New Orleans, La.	T. B. M. 96.	1.1591	Do.	P. B. M. North Boule-	15.8574
Do.	P. B. M. 41.	0.1691	Do.	vard.	
Do.	P. B. M. 3.	1.3070	Do.	Top of cap over same.	17.0611
Do.	T. B. M. 175.	0.6420	West Baton Rouge, La.	P. B. M. XXXII.	8.6169
Do.	P. B. M. 2.	2.7946	Near West Baton Rouge,	T. B. M. 90.	8.7632
Do.	Halfway House.	1.6354	La.		
Do.	City Stone XXMR.	1.4684	Do.	T. B. M. 89.	9.3809
Do.	City Park.	1.4715	Do.	T. B. M. 88.	9.4326
Do.	P. B. M. 1 <sup>a</sup> .	0.1288	Do.	B. M. 1 <sup>a</sup> .	9.9203
Do.	P. B. M. 1 <sup>a</sup> A.	1.3288	Do.	P. B. M. Poplar Grove.	8.5933
Do.	T. B. M. 170.	2.8451	Do.	Top of cap over same.	9.8095
Carrollton, La.	City Stone XXMB.	1.4040	Do.	T. B. M. 87.	9.4801
Do.	T. B. M. 160.	1.9083	Near Lobdell, La.	T. B. M. 85.	9.2164
Do.	P. B. M. Carrollton.	2.7300	Do.	T. B. M. 84.	9.2531
Do.	B. M. A (Ewens 1892).	1.8634	Do.	B. M. 1 <sup>a</sup> .	7.4629
Do.	Top of cap over same.	3.1076	Do.	Top of cap over same.	9.0091
Do.	B. M. 1 <sup>a</sup> .	0.1498	Do.	P. B. M. XXXIII.	9.3249
Do.	Top of cap over same.	1.3540	Do.	T. B. M. 83.	9.6769
Near Kenner, La.	B. M. 2 <sup>a</sup> .	0.0215	Lobdell, La.	T. B. M. 82.	8.9258
On Patterson Plantation,	Top of cap over same.	1.2145	Near Lobdell, La.	T. B. M. 80.	8.3106
La.	B. M. 2 <sup>a</sup> .	0.9672	Do.	P. B. M. Allendale.	7.7735
On Pecan Grove Planta-	Top of cap over same.	2.1757	Do.	Top of cap over same.	8.9834
tion, La.	B. M. 2 <sup>a</sup> .	1.9779	Near Devall, La.	P. B. M. XXXIV.	9.5536
Near St. Rose, La.	Top of cap over same.	3.1761	Do.	T. B. M. 75.	10.1348
Near Hahnville, La.	P. B. M. V.	4.6150	Do.	T. B. M. 74.	9.9524
Near Sarpy, La.	P. B. M. VI.	4.1731	Do.	P. B. M. Solitude.	8.9844
Near Sellers, La.	B. M. 2 <sup>a</sup> .	0.4719	Do.	Top of cap over same.	10.1875
Near La Place, La.	Top of cap over same.	1.6784	Do.	T. B. M. 73.	9.8867
Near St. Peters, La.	P. B. M. VII.	4.8156	Do.	T. B. M. 72.	9.2781
Near Garyville, La.	B. M. 2 <sup>a</sup> .	4.1785	Near Walls, La.	T. B. M. 70.	9.3964
Mount Airy, La.	Top of cap over same.	5.3865	Do.	B. M. 1 <sup>a</sup> .	9.2292
Do.	B. M. 2 <sup>a</sup> .	3.0229	Arbroth, La.	P. B. M. XXXV.	10.4698
Near Litcher, La.	Top of cap over same.	4.2250	Near Arbroth, La.	T. B. M. 65.	11.0788
Do.	B. M. 1 <sup>a</sup> .	4.5687	Near Hermitage, La.	B. M. 1 <sup>a</sup> .	11.1498
Near Myles, La.	Top of cap over same.	4.5679	Do.	T. B. M. 64.	10.2858
Do.	Chenet.	3.2842	Hermitage, La.	P. B. M. XXXVI.	11.5168
Near Litcher, La.	P. B. M. X.	5.5536	Near Hermitage, La.	T. B. M. 63.	10.6867
Do.	B. M. 1 <sup>a</sup> .	2.2209	Near Anchor, La.	T. B. M. 61.	11.5651
Near Litcher, La.	Top of cap over same.	3.4348	Do.	B. M. 1 <sup>a</sup> .	11.5224
Do.	T. B. M. 83.	4.0227	Do.	P. B. M. XXXVII.	13.7218
Do.	B. M. 1 <sup>a</sup> .	3.2168	Do.	T. B. M. 59.	11.6289
Near Hester, La.	Top of cap over same.	4.4291	Near Bayou Sara, La.	T. B. M. 58.	11.8293
Do.	B. M. 1 <sup>a</sup> .	3.4684	Do.	T. B. M. 57.	12.1791
Do.	Top of cap over same.	4.6877	Do.	T. B. M. 56.	11.8950
Do.	T. B. M. 71.	4.7620	Do.	P. B. M. XXXVIII.	12.0352
Do.	P. B. M. XII.	5.8430	Do.	T. B. M. 55.	12.2136
Do.	A Homestead.	4.9235	Do.	P. B. M. XXXIX.	11.9405
Do.	P. B. M. XIII.	7.8663	Do.	B. M. 1 <sup>a</sup> .	11.5993
Near College Landing, La.	B. M. 1 <sup>a</sup> .	5.0664	Do.	T. B. M. 53.	9.7991
Near Convent, La.	Top of cap over same.	6.2753	Near Pointe Coupee, La.	B. M. 1 <sup>a</sup> .	9.4504
On Celestine Plantation,	P. B. M. XIV.	7.2800	Do.	Top of cap over same.	10.9734
Colomb, La.	B. M. 1 <sup>a</sup> .	3.2453	Do.	P. B. M. XL.	11.3646
Near Whitehall, La.	Top of cap over same.	4.4539	Do.	T. B. M. 50.	12.1119
Near Miles, La.	P. B. M. XV.	7.1283	Near Brooks, La.	T. B. M. 49.	12.3496
Do.	B. M. 1 <sup>a</sup> .	4.9995	Do.	P. B. M. XLI.	12.2913
Near Burnside, La.	Top of cap over same.	6.2057	Do.	T. B. M. 47.	12.3779
Near Belle Helene, La.	B. M. 1 <sup>a</sup> .	3.2543	Do.	T. B. M. 46.	10.6025
New River, La.	Top of cap over same.	4.4621	Near Morganza, La.	B. M. 1 <sup>a</sup> .	10.7071
Near Gelsmar, La.	P. B. M. XVI.	7.5494	Do.	Top of cap over same.	12.2584
St. Gabriel, La.	B. M. 1 <sup>a</sup> .	6.1414	Do.	T. B. M. 43.	16.0196
Near Sunshine, La.	Top of pipe over same.	7.6607	Do.	T. B. M. 40.	15.6330
Do.	P. B. M. New River.	6.2216	Do.	T. B. M. 39.	10.5989
Do.	Top of cap over same.	7.4332	Do.	B. M. 1 <sup>a</sup> .	8.8543
Near Racourcel, La.	P. B. M. XX.	7.1794	Near Racourcel, La.	T. B. M. 38.	11.4751
Near Racourcel, La.	P. B. M. St. Gabriel.	5.4570	Racourcel, La.	T. B. M. 37.	12.0390
Near Racourcel, La.	Top of cap over same.	6.6652	Do.	P. B. M. XLII.	11.8185
Near Ennis, La.	T. B. M. 22.	7.7610	Near Racourcel, La.	T. B. M. 35.	15.9697
Do.	P. B. M. XXIV.	7.9216	Near Lacour, La.	T. B. M. 33.	14.3150
Do.	B. M. 1 <sup>a</sup> .	7.8261	Near Ennis, La.	P. B. M. XLIV.	13.7181

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
<i>meters.</i>			<i>meters.</i>		
Williamsport, La.	T. B. M. 22	14.8889	Near Vidalia, La.	T. B. M. 71	20.0991
Near Smithland, La.	T. B. M. 20	15.1112	Natchez, Miss.	(P. B. M. Waterworks.	20.5076
Do.	(P. B. M. Smithland.	13.4344	Do.	Top of cap over same.	21.7159
Smithland, La.	Top of cap over same.	14.6477	Do.	B. M. N. (Ewens 1886).	21.6928
Near Smithland, La.	P. B. M. XLV.	14.8127	Do.	T. B. M. 77	21.8548
Red River Landing, La.	T. B. M. 17	14.3848	Do.	B. M. 3 (Babbitt 1874).	24.5867
Do.	(Gauge B. M. W.	12.5004	Do.	B. M. A. (Ewens 1892).	27.7056
Do.	Top of cap over same.	13.7396	Do.	(P. B. M. 1.	59.6014
Do.	Gauge B. M. B.	13.8672	Palo Alto, La.	Top of cap over same.	60.8422
Do.	Gauge B. M. D.	14.9433	Near Vidalia, La.	LXIV.	19.8617
Near Red River Ldg., La.	B. M. 14	15.9325	Do.	B. M. 131	19.9465
Do.	T. B. M. 13	13.3581	Do.	(B. M. 131	17.4569
Do.	P. B. M. Carrs Point.	15.9459	Do.	Top of cap over same.	18.6663
Do.	T. B. M. 9	14.1246	Do.	T. B. M. 84	19.2863
In Louisiana, opposite	T. B. M. 6	15.3915	Do.	(P. B. M. Minorca.	18.2768
Tarbert, Miss.			Do.	Top of cap over same.	19.4922
Near Point Breeze, La.	P. B. M. L.	16.1945	Near Bullitt Bayou, La.	(P. B. M. Sycamore.	18.9219
Do.	T. B. M. 5	16.3836	Do.	Top of cap over same.	20.1335
Do.	P. B. M. LI.	16.2370	Do.	T. B. M. 92	19.9990
On Point Breeze, La.	T. B. M. 4-II. W.	15.8785	Do.	(P. B. M. Vidal.	19.1323
Do.	Gauge B. M. 49.	16.6117	Do.	Top of cap over same.	20.3497
Near Fort Adams, Miss.	B. M. 14	13.6997	Do.	T. B. M. 83	21.0629
Fort Adams, Miss.	T. B. M. 1	20.8838	Do.	T. B. M. 95	18.8690
	P. B. M. XLIX.		Do.	(B. M. 13	17.8012
			Do.	Top of cap over same.	19.0195
			Do.	T. B. M. 86	19.1216
Fort Adams, Miss.	(P. B. M. Fort Adams.	15.7421	Near Mabel, La.	T. B. M. 98	20.2399
Near Fort Adams, Miss.	Top of cap over same.	16.9510	Do.	(P. B. M. Vaucluse.	19.5339
On Point Breeze, La.	XLVIII.	23.9954	Do.	Top of cap over same.	20.7388
Near Nocks, La.	(P. B. M. Pt. Breeze.	15.2856	Do.	(B. M. 14	18.6032
Near Nocks, La.	Top of cap over same.	16.4064	Near L'Argent, La.	Top of cap over same.	20.1404
Near Black Hawk, La.	(P. B. M. Knox.	14.8864	Do.	T. B. M. 103	20.0961
Do.	Top of cap over same.	16.1020	Do.	B. M. 13	20.0779
Do.	(P. B. M. Ballymagan.	15.4330	Do.	T. B. M. 104	18.1934
Do.	Top of cap over same.	16.6484	Fairchild's Island, La.	(P. B. M. Fairchild's Is.	20.6422
Do.	T. B. M. 13	16.9338	Near Waterproof, La.	Top of cap over same.	21.8595
Do.	T. B. M. 14	16.6685	Do.	B. M. 13	20.4333
Do.	LIII.	16.0190	Waterproof, La.	LXXI.	20.6780
Do.	T. B. M. 15	16.8331	Near Goldman, La.	(P. B. M. Melwood.	21.0053
Do.	T. B. M. 17	17.4008	Do.	Top of cap over same.	22.2219
Do.	(P. B. M. Union Point.	16.1802	Do.	T. B. M. 114	25.0358
Do.	Top of cap over same.	17.3961	Do.	P. B. M. Kempe Bend	19.2897
Near Bougere, La.	B. M. 14	16.9714	Do.	T. B. M. 120	18.9693
Do.	LIV.	17.4028	Do.	(P. B. M. Stackhouse.	18.4729
Near Fairview, La.	T. B. M. 31	17.6262	Do.	Top of cap over same.	19.6958
Do.	(New B. M. 14	16.4237	In Louisiana, near Rodney,	No. 297 or LXXIII.	21.8257
Do.	Top of cap over same.	17.6382	Miss.		
Near Arnot, Miss.	T. B. M. 32	17.7147	Near St. Joseph, La.	B. M. 13	21.5973
Do.	T. B. M. 35	15.8578	Do.	(B. M. 13	20.3966
Near Fairview, La.	(P. B. M. Kindling.	14.8821	Do.	Top of cap over same.	21.9373
Do.	Top of cap over same.	16.0992	Do.	No. 291	23.3829
Do.	T. B. M. 36	17.5935	St. Joseph, La.	B. M. A. (1892).	22.5197
Do.	B. M. 14	17.6245	Do.	(P. B. M. Worrell.	22.1520
Do.	T. B. M. 38	16.0934	Do.	Top of cap over same.	23.3704
Do.	(P. B. M. Jones.	14.2039	Near Rodney, Miss.	(P. B. M. Woodland.	23.1795
Near Fish Pond, La.	Top of cap over same.	15.4177	Do.	Top of cap over same.	24.3987
Do.	T. B. M. 42	16.0431	St. Joseph, La.	T. B. M. 136	22.5237
Do.	(P. B. M. Fish Pond.	16.3485	Do.	(P. B. M. St. Joseph.	21.5402
Do.	Top of cap over same.	17.5684	Do.	Top of cap over same.	22.7549
Do.	T. B. M. 50	16.9425	Near St. Joseph, La.	No. 286	25.2371
Do.	(P. B. M. Hedge.	16.0223	Do.	(P. B. M. Bruin.	22.5521
Do.	Top of cap over same.	17.2389	Do.	Top of cap over same.	23.7693
Near Morville, La.	B. M. 13	19.0155	Do.	T. B. M. 141	24.4177
Do.	(P. B. M. Yeager.	17.6365	Do.	(P. B. M. Botany Bay.	22.2344
Do.	Top of cap over same.	18.8549	Do.	Top of cap over same.	23.4476
Do.	B. M. 14	15.9288	Near Hard Times Landing,	P. B. M. Winter Quar-	21.8297
Near Vidalia, La.	Top of cap over same.	17.1498	La.	ters.	
Do.	T. B. M. 61	18.8461	Do.	Top of cap over same.	23.0450
Do.	(P. B. M. Lucerna.	17.8798	Do.	(P. B. M. Hard Times	23.8954
Do.	Top of cap over same.	19.0913	Do.	Top of cap over same.	25.1022
Do.	T. B. M. 62	18.8493	Do.	T. B. M. 157	24.4198
Do.	T. B. M. 63	17.9275	Do.	(No. 272.	23.5827
Do.	(New B. M. 13	18.1809	Do.	Top of cap over same.	24.8031
Do.	Top of cap over same.	19.3906	Do.	T. B. M. 161	23.3020
Do.	T. B. M. 66	18.8916	Do.	Levee B. M. 133.	24.9066
Do.	Levee B. M. No. 448.	20.2447	Near Point Pleasant, La.	(P. B. M. Bland.	22.8326
Do.	LXI.	18.8737	Do.	Top of cap over same.	24.0505
Vidalia, La.	T. B. M. 69	19.0711	Do.	T. B. M. 170	24.4918
Do.	LXII.	19.4198	Do.	(P. B. M. McMillan.	25.0621
Do.	LXIII.	18.7230	Do.	Top of cap over same.	26.2757
Do.	(B. M. 13	18.2172	Near Ashwood, La.	T. B. M. 175	26.2100
Do.	Top of cap over same.	19.7712	Do.	(P. B. M. Somerset.	25.3555
			Do.	Top of cap over same.	26.5726

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Ashwood, La.	T. B. M. 176.	25.9584	Keokuk, Iowa.	P. B. M. 1 (1881).	150.4616
Near King, La.	T. B. M. 180.	24.4174	Do.	P. B. M. 2.	150.5766
Do.	P. B. M. Leons.	23.5275	Do.	P. B. M. 3.	155.3144
Do.	Top of cap over same.	24.7413	Near Keokuk, Iowa.	P. B. M. 4.	152.3484
Do.	T. B. M. 183.	26.3274	Alexandria, Mo.	P. B. M. 5.	151.9324
Do.	P. B. M. Chelula.	22.8642	Gregorys Landing, Mo.	P. B. M. 6.	148.9915
Do.	Top of cap over same.	24.0784	Near Gregorys Ldg., Mo.	P. B. M. 7.	151.1566
Near Griffin, La.	P. B. M. 232.	26.7805	Canton, Mo.	P. B. M. 8.	150.7064
Do.	P. B. M. 193.	27.2941	Do.	P. B. M. 9.	150.5057
Do.	P. B. M. Griffin.	26.3262	Near Lagrange, Mo.	P. B. M. 10.	147.5318
Do.	Top of cap over same.	27.5459	Lagrange, Mo.	P. B. M. 11.	147.4989
Do.	T. B. M. 194.	27.2884	West Quincy, Mo.	P. B. M. 12.	145.6368
Do.	T. B. M. 197.	24.8056	Fabius River, Mo.	P. B. M. 13.	145.8320
Near Delta, La.	P. B. M. Martin.	25.2302	Near Hilton, Mo.	P. B. M. 14.	144.7235
Delta, La.	Top of cap over same.	26.4541	Do.	P. B. M. 15.	143.6668
Do.	Range stone for SW.	26.4605	Hannibal, Mo.	P. B. M. 16.	149.1804
Do.	SW. Base.	26.7584	Near Hannibal, Mo.	P. B. M. 17.	141.7156
Do.	P. B. M. Delta.	26.3755	Saverton, Mo.	P. B. M. 18.	141.2938
Do.	Top of cap over same.	27.5909	Near Ashburn, Mo.	P. B. M. 19.	145.6627
Near Delta, La.	NE. Base.	27.9675	Do.	P. B. M. 20.	144.4985
Near Vicksburg, Miss.	P. B. M. B.	30.0064	Do.	P. B. M. 21.	139.1171
Kleinston, Miss.	M. R. C. 197.	26.9227	Near Louisiana, Mo.	P. B. M. 22.	142.8912
Do.	P. B. M. Pelican.	31.2051	Louisiana, Mo.	P. B. M. 23.	142.8824
			Do.	P. B. M. 24.	142.6010
			Near Louisiana, Mo.	P. B. M. 25.	141.1925
Cairo, Ill.	P. B. M. 4.	95.1584	Near Clarksville, Mo.	P. B. M. 26.	140.5566
Do.	P. B. M. 5.	95.7930	Clarksville, Mo.	P. B. M. 27.	141.9271
Fort Jefferson, Ky.	P. B. M. 6.	97.9414	Do.	P. B. M. 28.	140.4998
Columbus, Ky.	P. B. M. 7.	96.0548	In Illinois, opposite Clarks-	P. B. M. 29.	136.7930
Do.	P. B. M. 8.	93.8463	ville, Mo.		
Do.	P. B. M. 9.	94.3843	Do.	P. B. M. 30.	136.7762
Do.	P. B. M. 10.	137.8613	Do.	P. B. M. 31.	135.9176
Near Worshams Ldg., Ky.	P. B. M. 11.	93.4880	Near Hamburg, Ill.	P. B. M. 32.	142.5069
Do.	P. B. M. 12.	92.3300	Do.	P. B. M. 33.	156.9437
Near Hickman, Ky.	P. B. M. 13.	91.8649	Do.	P. B. M. 34.	135.5970
Hickman, Ky.	P. B. M. 14.	109.7967	Do.	P. B. M. 35.	133.8205
Do.	P. B. M. 15.	94.5025	Near Reds Landing, Ill.	P. B. M. 36.	133.5635
Near Hickman, Ky.	P. B. M. 16.	91.7399	Near Sterling Island, Ill.	P. B. M. 37.	133.4734
Do.	P. B. M. 17.	90.6617	Near Hogville Landing, Ill.	P. B. M. 38.	132.6108
Do.	P. B. M. 18.	89.9459	Turners Landing, Ill.	P. B. M. 39.	133.4784
Do.	P. B. M. 19.	90.2796	Near Turners Landing, Ill.	P. B. M. 40.	132.5384
Near Lesters Ldg., Tenn.	P. B. M. 20.	89.7612	West Point, Ill.	P. B. M. 41.	135.8678
Do.	P. B. M. 21.	89.4260	Near Hastings Landing, Ill.	P. B. M. 42.	134.9886
Tiptonville, Tenn.	P. B. M. 22.	88.4346	Near Martins Landing, Ill.	P. B. M. 43.	132.8020
Do.	P. B. M. 23.	90.1401	Near Millers Landing, Ill.	P. B. M. 44.	132.6709
Near Tiptonville, Tenn.	P. B. M. 24.	85.3762	Thomas Landing, Ill.	P. B. M. 45.	130.9157
Do.	P. B. M. 25.	85.6136	Near Dixons Landing, Ill.	P. B. M. 46.	138.5720
Near Reelfoot Ldg., Tenn.	P. B. M. 26.	84.8062	Near Point Landing, Ill.	P. B. M. 47.	131.7356
Mott Landing, Tenn.	P. B. M. 27.	82.4622			
Near Booths Point Land-	P. B. M. 28.	82.3532			
ing, Tenn.					
Near Booths Point, Tenn.	P. B. M. 29.	80.3305	Near Keokuk, Iowa.	P. B. M. 1 (1882).	152.8787
Do.	P. B. M. 30.	80.2301	Nashville, Iowa.	P. B. M. 2.	154.8152
Do.	P. B. M. 31.	80.4634	Montrose, Iowa.	P. B. M. 3.	161.6757
Near Hales Point, Tenn.	P. B. M. 32.	79.4159	Near Vile Station, Iowa.	P. B. M. 4.	165.5965
Do.	P. B. M. 33.	79.1575	Do.	P. B. M. 5.	163.7879
Do.	P. B. M. 34.	77.7216	Do.	P. B. M. 6.	165.2991
Near Forked Deer Island,	P. B. M. 35.	77.9401	Fort Madison, Iowa.	P. B. M. 7.	162.9198
Tenn.			Do.	P. B. M. 8.	164.4916
Near Ashport, Tenn.	P. B. M. 36.	77.6353	Near Fort Madison, Iowa.	P. B. M. 9.	166.4204
Do.	P. B. M. 37.	77.5003	Do.	P. B. M. 10.	167.0544
Do.	P. B. M. 38.	76.5764	Near Burlington, Iowa.	P. B. M. 11.	164.6400
Near Plum Point, Tenn.	P. B. M. 39.	76.0640	Burlington, Iowa.	P. B. M. 12.	162.9973
Do.	P. B. M. 40.	75.4114	Do.	P. B. M. 13.	165.3286
Near Fort Pillow Ldg., Tenn.	P. B. M. 41.	77.4427	Do.	P. B. M. 14.	165.3672
Near Fulton, Tenn.	P. B. M. 42.	91.0061	Do.	P. B. M. 15.	161.6087
Do.	P. B. M. 43.	75.2842	Do.	P. B. M. 16.	162.0965
Near Randolph, Tenn.	P. B. M. 44.	74.2686	Oquawka, Ill.	P. B. M. 17.	163.4605
Do.	P. B. M. 45.	74.0266	Do.	P. B. M. 18.	167.0710
Randolph, Tenn.	P. B. M. 46.	104.2980	Keithsburg, Ill.	P. B. M. 19.	164.5616
Near Randolph, Tenn.	P. B. M. 47.	119.6961	Do.	P. B. M. 20.	167.5852
Near Richardsons Land-	P. B. M. 48.	73.4242	Near New Boston, Ill.	P. B. M. 21.	169.1997
ing, Tenn.			New Boston, Ill.	P. B. M. 22.	166.2019
Do.	P. B. M. 49.	72.2917	Do.	P. B. M. 23.	173.9497
Near Paynes Landing, Tenn.	P. B. M. 50.	72.0765	Port Louisa, Iowa.	P. B. M. 24.	166.2468
Near Thomas Ldg., Tenn.	P. B. M. 51.	72.1055	Near Muscatine, Iowa.	P. B. M. 25.	165.9418
Do.	P. B. M. 52.	70.7566	Do.	P. B. M. 26.	167.1952
Near Brinkleys Ldg., Tenn.	P. B. M. 53.	69.1012	Muscatine, Iowa.	P. B. M. 27.	167.7789
Near Island No. 40, Tenn.	P. B. M. 54.	68.3435	Do.	P. B. M. 28.	168.2390
Do.	P. B. M. 55.	67.5222	Do.	P. B. M. 29.	168.3771
Near Memphis, Tenn.	P. B. M. 56.	67.4702	Near Muscatine, Iowa.	P. B. M. 30.	168.7362
			Do.	P. B. M. 31.	168.4978
			Do.	P. B. M. 32.	171.1313

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Fairport, Iowa.....	P. B. M. 33.....	169.3325	St. Paul, Minn.....	P. B. M. 67.....	216.0781
Near Montpelier, Iowa.....	P. B. M. 34.....	169.0438	Do.....	P. B. M. 68.....	214.4346
Do.....	P. B. M. 35.....	172.1554	Do.....	Old U. S. B. M. A.....	215.6512
Do.....	P. B. M. 35a.....	169.8678	Do.....	Old U. S. B. M. 2.....	211.9228
Buffalo, Iowa.....	P. B. M. 36.....	172.3459	Do.....	P. B. M. 70.....	214.8836
Near Buffalo, Iowa.....	P. B. M. 37.....	173.4123	Do.....	P. B. M. 71.....	216.1053
West Davenport, Iowa.....	P. B. M. 38.....	172.9757	Do.....	P. B. M. 72.....	237.9137
Near West Davenport, Iowa.....	P. B. M. 39.....	174.8219	Do.....	P. B. M. 73.....	213.4964
On Arsenal Island, Ill.....	P. B. M. 40.....	176.0659	Do.....	P. B. M. 74.....	214.7189
Rock Island, Ill.....	P. B. M. 41.....	177.2525	Daytons Bluff, Minn.....	P. B. M. 75.....	212.9508
Near Moline, Ill.....	P. B. M. 42.....	173.5184	Do.....	P. B. M. 76.....	214.1683
Watertown, Ill.....	P. B. M. 43.....	175.3768	Near Highwood, Minn.....	T. B. M. 8.....	215.8902
Hampton, Ill.....	P. B. M. 44.....	176.9475	Do.....	T. B. M. 9.....	212.8843
Do.....	P. B. M. 45.....	173.8924	Do.....	T. B. M. 10.....	216.9866
Rapids City, Ill.....	P. B. M. 46.....	175.7910	Do.....	P. B. M. 77.....	215.3968
Near Port Byron, Ill.....	P. B. M. 47.....	176.9009	Do.....	P. B. M. 78.....	216.6064
Port Byron, Ill.....	P. B. M. 48.....	177.3510	Near Red Rock, Minn.....	T. B. M. 11.....	221.4903
Do.....	P. B. M. 49.....	179.1530	Newport, Minn.....	T. B. M. 12.....	226.8773
Cordova, Ill.....	P. B. M. 50.....	175.0061	Do.....	P. B. M. 79.....	225.7062
Do.....	P. B. M. 51.....	181.4651	Do.....	P. B. M. 80.....	226.9250
Albany, Ill.....	P. B. M. 52.....	181.6514	Newport Landing, Minn.....	Old U. S. B. M. 12.....	211.3997
Near Albany, Ill.....	P. B. M. 53.....	182.5535	St. Paul Park, Minn.....	P. B. M. 81.....	227.3960
Do.....	P. B. M. 54.....	176.2522	Near St. Paul Park, Minn.....	T. B. M. 14.....	229.5552
Near Fulton, Ill.....	P. B. M. 55.....	177.2463	Do.....	P. B. M. 83.....	228.9326
Do.....	P. B. M. 56.....	177.6307	Do.....	P. B. M. 84.....	230.1492
Fulton, Ill.....	P. B. M. 57.....	182.1439	Near Pullman, Minn.....	T. B. M. 17.....	227.4471
Near Fulton, Ill.....	P. B. M. 58.....	177.7067	Near head of Nininger Slough, Minn.....	P. B. M. 85.....	211.6649
Fulton, Ill.....	B. M. 35.....	178.7352	Do.....	P. B. M. 86.....	212.8888
Near Fulton, Ill.....	P. B. M. 59.....	179.7843	Near Island 18, Minn.....	T. B. M. 22.....	211.4383
Thomson, Ill.....	P. B. M. 60.....	184.8174	Foot of Nininger Slough, Minn.....	P. B. M. 87.....	210.9157
Near Savanna, Ill.....	P. B. M. 61.....	178.9626	Do.....		
Savanna, Ill.....	P. B. M. 62.....	180.5371	Near mouth of Nininger Slough, Minn.....	Old U. S. B. M. 23.....	211.8087
Do.....	McKenzie B. M. 34.....	180.5381	Do.....		
Do.....	P. B. M. 63.....	182.8130	Near Hastings, Minn.....	T. B. M. 23.....	211.6692
Do.....	P. B. M. 64.....	181.0435	Do.....	P. B. M. 88.....	210.9707
Near Hickory Grove, Ill.....	P. B. M. 65.....	205.4613	Do.....	P. B. M. 89.....	212.1922
Mount Carroll, Ill.....	P. B. M. 66.....	249.0705	Do.....	P. B. M. 90.....	210.8008
Near Lanark, Ill.....	P. B. M. 67.....	240.4694	Hastings, Minn.....	P. B. M. 97.....	211.9196
Lanark, Ill.....	P. B. M. 68.....	269.2408	Point Douglas, Minn.....	T. B. M. 26.....	216.1757
Near Lanark, Ill.....	P. B. M. 69.....	256.1409	Do.....	P. B. M. 90.....	217.2506
Near Lanark Junction, Ill.....	P. B. M. 70.....	288.7953	Prescott, Wis.....	T. B. M. 27.....	212.9327
Forreston Junction, Ill.....	P. B. M. 71.....	267.3529	Do.....	P. B. M. 91.....	212.0099
Adeline, Ill.....	P. B. M. 72.....	228.8849	Do.....	T. B. M. 28.....	213.8903
Leaf River, Ill.....	P. B. M. 73.....	216.1481	Near Prescott, Wis.....	T. B. M. 30.....	209.1274
Byron, Ill.....	P. B. M. 74.....	222.3467	Do.....	P. B. M. 92.....	209.6248
Near Byron, Ill.....	P. B. M. 75.....	211.3672	Do.....	P. B. M. 93.....	210.8422
Stillman Valley, Ill.....	P. B. M. 76.....	215.4613	Do.....	P. B. M. 94.....	207.3612
Near Davis Junction, Ill.....	P. B. M. 77.....	246.4669	Do.....	P. B. M. 95.....	208.5797
Monroe, Ill.....	P. B. M. 78.....	256.9425	Near Smiths Bar, Wis.....	T. B. M. 35.....	208.5354
Felding, Ill.....	P. B. M. 79.....	239.5671	Smiths Landing, Wis.....	P. B. M. 98.....	207.6436
Kirkland, Ill.....	P. B. M. 80.....	236.1657	Do.....	P. B. M. 99.....	208.8623
Kingston, Ill.....	P. B. M. 81.....	245.3587	Do.....	T. B. M. 37.....	207.2726
Genoa, Ill.....	P. B. M. 82.....	255.6348	Near Smiths Landing, Wis.....	T. B. M. 38.....	208.4632
Hampshire, Ill.....	P. B. M. 83.....	274.4270	Near Morgans Coulee, Wis.....	T. B. M. 39.....	209.7880
Pingree Grove, Ill.....	P. B. M. 84.....	279.7561	Near Diamond Bluff, Wis.....	T. B. M. 40.....	212.1290
Near Dumser, Ill.....	P. B. M. 85.....	259.3024	Do.....	T. B. M. 47.....	207.2679
West Elgin, Ill.....	P. B. M. 86.....	218.6918	Do.....	P. B. M. 100.....	208.6421
Do.....	P. B. M. 87.....	218.0714	Do.....	P. B. M. 101.....	209.8590
East Elgin, Ill.....	B. M. Newcomb.....	227.3473	Diamond Bluff, Wis.....	T. B. M. 45.....	220.5629
Near Elgin, Ill.....	P. B. M. 88.....	220.0242	Do.....	P. B. M. 102.....	220.3534
Bartlett, Ill.....	P. B. M. 89.....	245.0770	Do.....	P. B. M. 103.....	221.6693
Roselle, Ill.....	P. B. M. 90.....	235.3532	Near Diamond Bluff, Wis.....	T. B. M. 46.....	221.1968
Itasca, Ill.....	P. B. M. 91.....	213.0869	Do.....	P. B. M. 104.....	219.6966
Bensenville, Ill.....	P. B. M. 92.....	207.6170	Do.....	P. B. M. 105.....	220.9179
Manheim, Ill.....	P. B. M. 93.....	198.4493	Do.....	T. B. M. 48.....	220.4107
Cragin, Ill.....	P. B. M. 94.....	188.3875	Trenton, Wis.....	T. B. M. 50.....	233.2993
Chicago, Ill.....	P. B. M. 95.....	180.3844	Trenton Landing, Wis.....	T. B. M. 51.....	206.1081
Do.....	P. B. M. 97.....	181.6065	Do.....	P. B. M. 106.....	205.7797
Do.....	P. B. M. 99.....	180.3077	Do.....	P. B. M. 107.....	207.0031
In Lake Michigan, Ill.....	P. B. M. 100.....	179.2116	Near Island 24, Wis.....	T. B. M. 52.....	206.5477
Chicago, Ill.....	B. M. I.....	181.5427	Near Puckerville, Wis.....	T. B. M. 53.....	208.4448
Do.....	B. M. II.....	181.0552	Do.....	P. B. M. 108.....	205.6230
Do.....	B. M. III.....	179.7930	Do.....	P. B. M. 109.....	208.5395
Do.....	B. M. IV.....	180.9759	Puckerville, Wis.....	P. B. M. 110.....	206.4586
Do.....	B. M. VII.....	180.7963	Do.....	P. B. M. 111.....	206.6684
Do.....	B. M. IX.....	180.8971	Red Wing, Minn.....	P. B. M. 112.....	209.8470
Do.....	B. M. XIII.....	179.5749	Do.....	P. B. M. 113.....	206.6613
St. Paul, Minn.....	P. B. M. 66.....	219.0777	Near Red Wing, Minn.....	T. B. M. 57.....	209.8421
Do.....	T. B. M. 1.....	218.5383	Do.....	T. B. M. 58.....	215.8983
Do.....	P. B. M. 65.....	217.8678	Do.....	P. B. M. 114.....	212.6615
			Do.....	P. B. M. 115.....	213.8767

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Red Wing, Minn.	T. B. M. 59.	205.0757	Island 69, Wis.	P. B. M. 162.	201.3903
Do.	T. B. M. 60.	205.1031	Do.	P. B. M. 163.	202.1090
Do.	T. B. M. 61.	204.8038	Near Island 69, Wis.	T. B. M. 126.	202.8991
Near Wacouta, Minn.	P. B. M. 116.	206.3216	Opposite Winona, Minn.,	T. B. M. 127.	203.9335
Do.	P. B. M. 117.	207.5390	In Wis.		
Wacouta, Minn.	P. B. M. 118.	206.2344	Do.	P. B. M. 164.	197.5087
Do.	P. B. M. 119.	207.5036	Do.	P. B. M. 165.	198.7187
Near Lake Side, Minn.	P. B. M. 120.	205.7486	Winona, Minn.	Old U. S. B. M. XVII.	200.9624
Do.	P. B. M. 121.	206.9922	Do.	P. B. M. 166.	200.7184
Do.	T. B. M. 66.	205.0775	Do.	P. B. M. 167.	201.8701
Do.	T. B. M. 67.	204.8453	Do.	New gauge at Winona.	195.2829
Do.	T. B. M. 69.	204.4967	Do.	Old U. S. B. M. b.	201.0846
Do.	T. B. M. 70.	204.0887	Do.	Winona City B. M.	200.7593
Lake Side, Minn.	P. B. M. 122.	205.8794	Do.	Old U. S. B. M.	200.9899
Do.	P. B. M. 123.	207.0952	Do.	P. B. M. 168.	203.2550
Florence, Minn.	T. B. M. 78.	209.0835	Do.	Old U. S. B. M. B.	200.6246
Do.	P. B. M. 124.	207.3179	Do.	Old U. S. B. M. on	201.6538
Do.	P. B. M. 125.	208.5374	Liberty and Second		
Near Florence, Minn.	T. B. M. 77.	206.1598	streets.		
Central Point, Minn.	P. B. M. 126.	206.0973	Do.	Old U. S. B. M. on	203.6769
Do.	P. B. M. 127.	207.3122	Do.	Keys's barn.	
Lake City, Minn.	P. B. M. 128.	210.3941	Do.	P. B. M. 169.	202.5042
Do.	P. B. M. 129.	210.4122	Minneapolis, Minn.	P. B. M. 170.	198.3020
Do.	Old U. S. B. M.	205.9695	Do.	P. B. M. 171.	199.5788
Near Lake City, Minn.	P. B. M. 130.	211.1200	Near Winona, Minn.	T. B. M. 130.	200.0946
Do.	P. B. M. 131.	212.3411	Near Homer, Minn.	T. B. M. 131.	201.4576
Do.	T. B. M. 84.	208.7666	Do.	P. B. M. 172.	200.7141
Near Kings Coulee, Minn.	T. B. M. 86.	207.4123	Do.	P. B. M. 173.	201.6906
Keplers Coulee, Minn.	P. B. M. 132.	207.6824	Do.	T. B. M. 132.	200.7490
Kings Coulee, Minn.	T. B. M. 87.	207.5826	Do.	T. B. M. 133.	201.4644
Near Kings Coulee, Minn.	P. B. M. 133.	208.3049	Do.	P. B. M. 174.	204.0359
Do.	P. B. M. 134.	209.5273	Do.	P. B. M. 175.	205.2556
Dutchmans Coulee, Minn.	T. B. M. 88.	207.1969	Near Lamolite, Minn.	T. B. M. 135.	200.2138
Near Kings Coulee, Minn.	T. B. M. 89.	208.6168	Lamolite, Minn.	P. B. M. 176.	199.5520
Near Reeds Landing, Minn.	T. B. M. 90.	207.8527	Do.	P. B. M. 177.	200.7674
Do.	P. B. M. 135.	209.0111	Near Richmond, Minn.	T. B. M. 142.	204.3785
Near Roscoes Coulee, Minn.	P. B. M. 136.	210.2297	Richmond, Minn.	P. B. M. 178.	199.9673
Reeds Landing, Minn.	T. B. M. 91.	208.6655	Do.	P. B. M. 179.	201.1771
Do.	P. B. M. 137.	209.2843	Do.	T. B. M. 144.	200.0301
Do.	T. B. M. 93.	208.4986	Near Dakota, Minn.	P. B. M. 146.	204.7323
Do.	Old U. S. B. M. A.	210.5122	Near Richmond, Minn.	P. B. M. 180.	202.2103
Do.	P. B. M. 138.	209.0239	Do.	P. B. M. 181.	203.4322
Do.	P. B. M. 139.	210.2397	Dakota, Minn.	P. B. M. 182.	202.1616
Wabasha, Minn.	P. B. M. 140.	210.6587	Do.	P. B. M. 183.	203.3906
Do.	Old U. S. B. M. 62.	206.6494	Do.	Old U. S. B. M. 131.	199.1014
Do.	Old U. S. B. M. E.	210.6219	Dresbach, Minn.	Old U. S. B. M. 130.	197.7238
Do.	P. B. M. 141.	206.9464	Do.	P. B. M. 184.	210.3406
Do.	P. B. M. 142.	206.1509	Near Dresbach, Minn.	T. B. M. 151.	201.2667
Tespeota Point, Minn.	P. B. M. 143.	205.3121	Do.	P. B. M. 185.	200.1801
Do.	P. B. M. 144.	206.5261	Do.	P. B. M. 186.	201.4023
Near Alma, Wis.	P. B. M. 145.	202.5084	Do.	T. B. M. 153.	202.3182
Do.	P. B. M. 146.	203.7254	Near River Junction, Minn.	T. B. M. 154.	201.3993
Alma, Wis.	T. B. M. 104.	205.6014	Near La Crescent, Minn.	P. B. M. 187.	199.1025
Do.	P. B. M. 147.	205.6024	Do.	P. B. M. 188.	200.3274
Do.	Old U. S. B. M. 1.	207.5582	Do.	T. B. M. 155.	198.4150
Do.	Old U. S. B. M. 3.	208.1541	Near La Crosse, Wis.	Old U. S. B. M. 139.	198.7155
Do.	P. B. M. 148.	209.6760	Do.	P. B. M. 189.	199.2238
Do.	Old U. S. B. M. 4.	207.4263	Do.	P. B. M. 190.	199.2463
Do.	T. B. M. 106.	206.8902	North La Crosse, Wis.	T. B. M. 157.	198.0534
Do.	P. B. M. 149.	206.1154	Do.	P. B. M. 191.	197.3414
Do.	P. B. M. 150.	207.3275	Do.	T. B. M. 158.	197.0045
Do.	T. B. M. 107.	205.5664	La Crosse, Wis.	City B. M. (Front	198.7062
Do.	P. B. M. 151.	203.8482	street).		
Do.	P. B. M. 152.	205.0646	Do.	P. B. M. 192.	207.2879
Near Cochrane, Wis.	P. B. M. 153.	204.3543	Do.	T. B. M. 160.	200.5680
Do.	P. B. M. 154.	205.5758	Do.	City B. M. (near	195.5204
Near Fountain City, Wis.	T. B. M. 117.	203.7917	bridge).		
Do.	P. B. M. 155.	200.5464	Do.	P. B. M. 193.	198.4262
Do.	P. B. M. 156.	201.7642	Do.	T. B. M. 161.	201.4418
Do.	T. B. M. 121.	201.4732	Do.	T. B. M. 162.	205.6465
Do.	P. B. M. 157.	199.7847	Do.	P. B. M. 194.	198.1556
Do.	P. B. M. 158.	201.0045	Do.	P. B. M. 195.	199.3733
Fountain City, Wis.	T. B. M. 122.	203.1829	Near Stoddard, Wis.	P. B. M. 196.	196.2226
Do.	Old U. S. B. M. 1 H.	201.0312	Do.	P. B. M. 197.	197.4362
Do.	W. G.		Do.	T. B. M. 170.	198.1075
Do.	Old U. S. B. M. A.	205.0547	Do.	T. B. M. 172.	196.5294
Do.	P. B. M. 159.	206.0034	Stoddard, Wis.	P. B. M. 198.	198.9084
Near Fountain City, Wis.	T. B. M. 123.	202.6323	Warners Landing, Wis.	P. B. M. 199.	194.2361
Do.	P. B. M. 160.	204.1037	Do.	P. B. M. 200.	196.4547
Do.	P. B. M. 161.	205.3226	Britts Landing, Wis.	T. B. M. 175.	196.3457
Near Island 65, Wis.	T. B. M. 124.	203.5940	Near Genos, Wis.	P. B. M. 201.	194.7079
Island 69, Wis.	T. B. M. 125.	202.0738	Do.	P. B. M. 202.	195.9315



## Corrected elevations of permanent bench marks—Continued.

Place	Designation of bench mark	Corrected elevation	Place	Designation of bench mark	Corrected elevation
		meters			meters
Near Geneva, Wis.	T. B. M. 177	145.274	Guttenberg, Iowa	P. B. M. 247	182.5708
Do	T. B. M. 178	145.855	Do	P. B. M. 248	184.5447
Do	P. B. M. 244	181.822	Do	T. B. M. 250	187.9483
Geneva, Wis.	Old U. S. B. M. 1	185.297	Near Guttenberg, Iowa	T. B. M. 252	189.9482
Near Geneva, Wis.	T. B. M. 149	145.769	Do	P. B. M. 249	188.0733
Do	P. B. M. 244	143.970	Do	P. B. M. 250	189.2912
Do	P. B. M. 245	144.729	Do	T. B. M. 253	189.7112
Tippets Landing, Wis.	T. B. M. 180	145.510	Do	T. B. M. 254	192.2928
Do	P. B. M. 249	149.0215	Near Turkey River Junction, Iowa	T. B. M. 256	190.4599
Do	P. B. M. 247	197.2441	Turkey River Jct., Iowa	P. B. M. 251	190.9835
Victory, Wis.	P. B. M. 248	185.353	Do	T. B. M. 257	187.9610
Near Victory, Wis.	T. B. M. 188	144.7301	Do	P. B. M. 252	187.9646
Near De Soto, Wis.	P. B. M. 249	143.1523	Near Turkey River Junction, Iowa	T. B. M. 256	189.9828
Do	P. B. M. 210	144.3739	Near Buena Vista, Iowa	P. B. M. 253	188.1507
Do	T. B. M. 192	144.5433	Do	P. B. M. 254	189.3699
De Soto, Wis.	T. B. M. 193	145.844	Do	T. B. M. 262	190.7615
Do	P. B. M. 211	191.0991	Buena Vista, Iowa	T. B. M. 264	191.2222
Do	P. B. M. 212	194.1287	Do	P. B. M. 255	191.3195
Near De Soto, Wis.	T. B. M. 195	194.1390	Near Buena Vista, Iowa	T. B. M. 265	191.5161
Do	P. B. M. 213	192.6547	Do	T. B. M. 267	191.3726
Do	P. B. M. 214	143.9639	Near Waupeton, Iowa	P. B. M. 256	190.1798
Do	T. B. M. 196	143.9725	Do	P. B. M. 257	191.3969
Near Rush Creek, Wis.	T. B. M. 197	194.0976	Do	T. B. M. 269	191.9029
Near Ferryville, Wis.	T. B. M. 198	143.2157	Do	T. B. M. 270	190.9465
Do	P. B. M. 215	192.8257	Do	P. B. M. 258	187.7582
Do	P. B. M. 216	194.0463	Do	P. B. M. 259	188.9739
Ferryville, Wis.	T. B. M. 200	183.0109	Do	T. B. M. 273	190.9995
Do	P. B. M. 217	191.7914	Finley Landing, Iowa	P. B. M. 260	188.6789
Do	P. B. M. 218	143.0129	Do	P. B. M. 261	189.8986
Near Ferryville, Wis.	T. B. M. 202	183.7716	Near Island 207, Iowa	P. B. M. 262	187.6882
Do	T. B. M. 204	192.0767	Frenchtown Landing, Iowa	T. B. M. 277	187.1924
Do	P. B. M. 219	190.4661	Do	P. B. M. 263	186.2409
Do	P. B. M. 220	191.6745	Do	P. B. M. 264	187.4602
Near Lynxville, Wis.	P. B. M. 221	192.0316	Spechts Ferry, Iowa	Old P. B. M. No. 30	187.6343
Do	P. B. M. 222	193.2517	Do	Old U. S. B. M. a	187.7793
Do	T. B. M. 206	192.9687	Do	P. B. M. 265	186.4022
Lynxville, Wis.	T. B. M. 207	193.6784	Do	P. B. M. 266	187.6208
Do	Old U. S. B. M.	194.5295	Do	T. B. M. 279	188.3801
Do	P. B. M. 223	194.7127	Near Spechts Ferry, Iowa	T. B. M. 280	188.5820
Near Lynxville, Wis.	T. B. M. 209	192.9362	Do	P. B. M. 267	185.8407
Viola, Wis.	T. B. M. 211	192.8857	Do	P. B. M. 268	187.0637
Do	P. B. M. 224	192.1174	2½ miles above Little Maquoketa River, Iowa	P. B. M. 269	188.4365
Do	P. B. M. 225	193.3358	Do	P. B. M. 270	189.6634
Near Viola, Wis.	T. B. M. 212	193.5966	1½ miles above Little Maquoketa River, Iowa	T. B. M. 283	187.9783
Do	T. B. M. 213	193.7617	¾ mile above Edmore, Iowa	P. B. M. 271	186.6719
Near Charne, Wis.	T. B. M. 215	191.8555	Do	P. B. M. 272	187.8908
Do	P. B. M. 226	192.3455	2.3 miles above Eagle Point, Iowa	T. B. M. 287	186.3664
Do	P. B. M. 227	193.5653	Do	P. B. M. 273	185.4439
Do	P. B. M. 228	193.7689	Do	P. B. M. 274	186.6614
Charne, Wis.	T. B. M. 216	193.2581	Near Eagle Point, Iowa	T. B. M. 289	188.5105
Near Charne, Wis.	T. B. M. 218	192.7000	Eagle Point, Iowa	T. B. M. 291	185.6179
Do	P. B. M. 229	192.2482	Dubuque, Iowa	P. B. M. 275	184.7073
Do	P. B. M. 230	193.4666	Do	P. B. M. 276	185.3599
Prairie du Chien, Wis.	T. B. M. 225	194.9126	Do	P. B. M. 277	186.5774
Do	P. B. M. 231	196.2080	Eagle Point, Iowa	Old U. S. B. M. 23	181.2496
Do	P. B. M. 232	192.4287	Dubuque, Iowa	T. B. M. 293	186.2938
Do	Old U. S. B. M. a	192.4289	Do	T. B. M. 294	185.8100
Do	T. B. M. 226	190.8889	Do	P. B. M. 278	185.8483
North McGregor, Iowa	T. B. M. 227	189.2763	Do	T. B. M. 295	185.2151
Do	P. B. M. 233	192.4961	Do	P. B. M. 279	196.5809
South McGregor, Iowa	T. B. M. 228	191.7474	Do	P. B. M. 280	188.4334
Do	P. B. M. 234	192.6062	East Dubuque, Ill.	Old U. S. B. M. a	187.5599
Do	P. B. M. 235	192.9564	Do	Old U. S. B. M. b	187.3367
Near South McGregor, Iowa	T. B. M. 230	192.7602	Dubuque, Iowa	T. B. M. 296	186.4721
Do	P. B. M. 236	191.4206	Do	City B. M. Julien House	186.7626
Do	P. B. M. 237	192.6403	Do	City B. M. Jess's store	185.6498
Do	P. B. M. 238	193.8879	Do	T. B. M. 297	186.4467
Do	T. B. M. 231	191.3553	Do	Old U. S. B. M. a	185.1845
Near Island 176, Iowa	T. B. M. 282	190.5191	Do	Old U. S. B. M. b	184.8379
Near Bny McGill, Iowa	P. B. M. 239	190.4312	Do	P. B. M. 281	186.7122
Do	P. B. M. 240	191.5489	Near Dubuque, Iowa	T. B. M. 299	186.1967
Clayton, Iowa	Old U. S. B. M. b	189.8197	Do	P. B. M. 282	185.9721
Do	Old U. S. B. M.	190.9158	Do	P. B. M. 283	187.1911
Do	P. B. M. 241	198.2825	Near Cattese, Iowa	T. B. M. 301	188.0385
Near Clayton, Iowa	T. B. M. 239	192.7185	Do	P. B. M. 284	186.8822
Do	P. B. M. 242	192.2905	Do	P. B. M. 285	188.1014
Do	T. B. M. 241	191.5752			
Near Eckard, Iowa	P. B. M. 243	189.0440			
Do	P. B. M. 244	190.2648			
Do	T. B. M. 245	189.9592			
Near Guttenberg, Iowa	P. B. M. 245	188.2880			
Do	P. B. M. 246	189.6053			

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Cattese, Iowa.....	T. B. M. 302.....	188.1613	Minneapolis, Minn.....	T. B. M. 13.....	256.3217
Near Cattese, Iowa.....	T. B. M. 303.....	187.4991	Do.....	P. B. M. University Campus.....	257.0238
Do.....	T. B. M. 304.....	185.1388	Do.....	P. B. M. Pillsbury Hall.....	258.6782
Do.....	Old U. S. B. M. 24.....	180.1788	Do.....	T. B. M. 12.....	252.6559
Shawondasee Club Grounds, Iowa.....	P. B. M. 286.....	183.7538	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	242.2623
Do.....	P. B. M. 287.....	184.9730	Do.....	Top of cap over same.....	243.4753
Near Massey, Iowa.....	T. B. M. 307.....	185.8618	Do.....	P. B. M. Great North-ern.....	258.6190
Do.....	T. B. M. 308.....	185.0665	Do.....	P. B. M. Brewery.....	249.0012
Near Nine Mile Island, Iowa.....	P. B. M. 288.....	184.0568	Do.....	T. B. M. 11.....	252.4687
Do.....	P. B. M. 289.....	185.2758	Do.....	P. B. M. Gluck.....	253.5814
Do.....	T. B. M. 311.....	186.4277	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	253.2291
Near Snyders, Iowa.....	T. B. M. 312.....	186.4076	Do.....	Top of cap over same.....	254.4426
Near Gordons Ferry, Iowa.....	P. B. M. 290.....	184.2510	Do.....	T. B. M. 3.....	254.1479
Do.....	P. B. M. 291.....	185.4711	Near Minneapolis, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	253.6765
Do.....	T. B. M. 314.....	182.6565	Do.....	Top of cap over same.....	254.6836
Do.....	P. B. M. 292.....	183.1197	Near Fridley, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	258.4398
Do.....	P. B. M. 293.....	184.3399	Do.....	Top of cap over same.....	259.6518
Do.....	T. B. M. 315.....	186.5865	Near Anoka, Minn.....	T. B. M. 27.....	270.7572
Gordons Ferry, Iowa.....	P. B. M. 294.....	187.2681	Do.....	(P. B. M. Dunn $\Delta$ ).....	267.5649
Do.....	P. B. M. 295.....	188.4824	Do.....	Top of cap over same.....	268.7795
Near Gordons Ferry, Iowa.....	T. B. M. 318.....	186.3096	Do.....	T. B. M. 29.....	260.9467
Do.....	P. B. M. 296.....	185.0978	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	254.7970
Do.....	P. B. M. 297.....	186.3205	Do.....	Top of cap over same.....	256.0024
Near Smiths Station, Iowa.....	T. B. M. 321.....	185.2192	Do.....	(P. B. M. Powell $\Delta$ ).....	264.5909
Do.....	P. B. M. 298.....	183.5547	Do.....	Top of cap over same.....	265.8059
Do.....	P. B. M. 299.....	184.7687	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	261.2179
Do.....	T. B. M. 323.....	185.5800	Do.....	Top of cap over same.....	262.4261
Do.....	P. B. M. 300.....	184.7891	Anoka, Minn.....	P. B. M. Anoka.....	259.1114
Do.....	P. B. M. 301.....	186.0007	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	256.9297
Near North Bellevue, Iowa.....	P. B. M. 302.....	190.9813	Do.....	Top of cap over same.....	258.1420
Do.....	P. B. M. 303.....	180.3861	Near Anoka, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	261.5139
Do.....	P. B. M. 304.....	181.5971	Do.....	Top of cap over same.....	262.7219
Bellevue, Iowa.....	P. B. M. 305.....	188.6572	Near Itasca, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	268.4857
Do.....	P. B. M. 306.....	189.8753	Do.....	Top of cap over same.....	269.6961
Do.....	P. B. M. 307.....	188.7774	Near Elk River, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	270.2400
Do.....	Old U. S. B. M.....	181.9916	Do.....	Top of cap over same.....	271.4544
Do.....	T. B. M. 326.....	185.4423	Elk River, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	271.9633
Do.....	P. B. M. 308.....	186.2050	Do.....	Top of cap over same.....	273.1684
Near Bellevue, Iowa.....	P. B. M. 309.....	184.4690	Do.....	P. B. M. Elk River.....	266.4753
Do.....	P. B. M. 310.....	185.6816	Near Otsego, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	273.8757
Do.....	T. B. M. 329.....	184.6370	Do.....	Top of cap over same.....	275.0818
Do.....	T. B. M. 331.....	183.0190	Near Monticello, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	271.9476
Do.....	P. B. M. 311.....	181.5629	Do.....	Top of cap over same.....	273.1513
Do.....	P. B. M. 312.....	182.7797	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	282.5230
Do.....	P. B. M. 313.....	179.5391	Do.....	Top of cap over same.....	283.7139
Do.....	P. B. M. 314.....	180.7494	Do.....	(P. B. M. East Base.....	284.1253
Do.....	P. B. M. 315.....	179.1484	Do.....	Top of cap over same.....	285.3394
Do.....	P. B. M. 316.....	180.3568	Do.....	(P. B. M. West Base.....	284.0102
Harris Landing, Ill.....	P. B. M. 317.....	186.2821	Do.....	Top of cap over same.....	285.2176
Do.....	P. B. M. 318.....	187.4711	Monticello, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	284.7662
Do.....	P. B. M. 319.....	186.6063	Do.....	Top of cap over same.....	285.9730
Do.....	P. B. M. 320.....	187.8248	Do.....	T. B. M. 70.....	278.5493
Near Harris Landing, Ill.....	P. B. M. 321.....	188.9824	Near Monticello, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	289.7194
Do.....	P. B. M. 322.....	190.2015	Do.....	Top of cap over same.....	290.9277
Opposite foot of Island 256.....	P. B. M. 323.....	190.2562	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	289.2554
Do.....	P. B. M. 324.....	191.4745	Do.....	Top of cap over same.....	290.4668
Near Arnold Landing, Ill.....	P. B. M. 325.....	178.7241	Near Bear Island, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	294.5382
Do.....	P. B. M. 326.....	179.9411	Do.....	Top of cap over same.....	295.7431
Arnold Landing, Ill.....	P. B. M. 327.....	186.3993	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	295.9941
Near Arnold Landing, Ill.....	P. B. M. 328.....	181.0803	Do.....	Top of cap over same.....	297.2020
Do.....	P. B. M. 329.....	182.2894	Near Clearwater, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	298.9811
Near Marcus, Ill.....	P. B. M. 330.....	178.0874	Do.....	Top of cap over same.....	300.1918
Do.....	P. B. M. 331.....	179.3087	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	291.3094
Near Savanna, Ill.....	P. B. M. 332.....	179.7850	Do.....	Top of cap over same.....	292.5178
Do.....	P. B. M. 333.....	181.0074	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	305.1407
Do.....	P. B. M. 334.....	180.4612	Do.....	Top of cap over same.....	306.3474
Do.....	P. B. M. 335.....	181.6780	Near St. Augusta, Minn.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	307.9899
Savanna, Ill.....	Old U. S. B. M. 18.....	176.8579	Do.....	Top of cap over same.....	309.1941
Do.....	P. B. M. 336.....	182.5681	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	308.6847
Do.....	P. B. M. 337.....	178.6157	East St. Cloud, Minn.....	Top of cap over same.....	309.8933
Do.....	P. B. M. 338.....	179.8325	St. Cloud, Minn.....	P. B. M. St. Cloud.....	314.9928
St. Paul, Minn.....	T. B. M. 23.....	248.7074	Near St. Cloud, Minn.....	T. B. M. 110.....	306.3882
Do.....	T. B. M. 22.....	252.5666	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	305.5488
Do.....	P. B. M. Macalester.....	284.4923	Near Sauk Rapids, Minn.....	Top of cap over same.....	306.7564
Do.....	Top of cap over same.....	285.7018	Do.....	T. B. M. 112.....	307.1092
Do.....	T. B. M. 18.....	277.1738	Do.....	(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	312.9179
Do.....	T. B. M. 16.....	265.1384	Near Little Rock, Minn.....	Top of cap over same.....	314.1284
				(P. B. M. <sup>2</sup> / <sub>1</sub> ).....	312.3067
				Top of cap over same.....	313.5144

*Corrected elevations of permanent bench marks -Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Rice, Minn.	P. B. M. 253	314.4627	Brainerd, Minn.	T. B. M. 201	367.8658
	Top of cap over same	315.6775	Near Leaks, Minn.	T. B. M. 3	371.9939
Do.	P. B. M. Back Base	322.0790	Do.	T. B. M. 5	372.7070
	Top of cap over same	323.2917	Near Merrifield, Minn.	T. B. M. 6	372.6763
Do.	P. B. M. River Base	320.9829		P. B. M. Merrifield	370.9312
	Top of cap over same	322.1958	Merrifield, Minn.	Top of cap over same	372.1443
Do.	P. B. M. 254	321.5925	Near Merrifield, Minn.	T. B. M. 10	371.8483
	Top of cap over same	322.8045	Near Hubert, Minn.	T. B. M. 13	372.2203
Do.	P. B. M. 255	321.1711	Do.	T. B. M. 14	372.4117
	Top of cap over same	322.3816	Hubert, Minn.	T. B. M. 16	367.5450
Near North Prairie, Minn.	P. B. M. 256	318.7369	Near Hubert, Minn.	T. B. M. 18	373.9402
	Top of cap over same	319.9450	Near Pequot, Minn.	T. B. M. 20	367.2439
Do.	P. B. M. 257	324.9938	Do.	T. B. M. 21	372.6061
	Top of cap over same	326.2064	Do.	T. B. M. 22	378.8559
Near Royalton, Minn.	P. B. M. 258	331.6926	Do.	T. B. M. 23	369.2882
	Top of cap over same	332.9043	Pequot, Minn.	T. B. M. 24	391.2189
Do.	P. B. M. 259	333.1223		P. B. M. Pequot	389.8064
	Top of cap over same	334.3224	Do.	Top of cap over same	391.0160
Near Little Falls, Minn.	P. B. M. 260	336.4376	Near Pequot, Minn.	T. B. M. 26	388.4008
	Top of cap over same	337.6405	Jenkins, Minn.	T. B. M. 28	386.6816
Do.	P. B. M. 261	339.2953	Near Pine River, Minn.	T. B. M. 30	389.0543
	Top of cap over same	340.5057	Do.	T. B. M. 31	388.4892
Little Falls, Minn.	T. B. M. 152	339.7309	Do.	T. B. M. 32	390.6313
Near Little Falls, Minn.	P. B. M. 262	341.1403	Do.	T. B. M. 33	393.0725
	Top of cap over same	342.3571	Pine River, Minn.	T. B. M. 35	395.9339
Belle Prairie, Minn.	P. B. M. 263	344.1169		P. B. M. Pine River	395.0112
	Top of cap over same	345.3292	Do.	Top of cap over same	396.2163
Near Belle Prairie, Minn.	P. B. M. 264	346.4357	Near Pine River, Minn.	T. B. M. 37	399.8586
	Top of cap over same	347.6461	Near Mildred, Minn.	T. B. M. 39	409.4174
Near Fort Ripley, Minn.	P. B. M. 265	348.4858	Do.	T. B. M. 41	406.8522
	Top of cap over same	349.7005	Near Backus, Minn.	T. B. M. 43	411.4886
Do.	P. B. M. 266	351.0167	Backus, Minn.	P. B. M. Backus	407.4816
	Top of cap over same	352.2357		Top of cap over same	408.6916
Do.	P. B. M. 267	354.0051	Near Island Lake, Minn.	T. B. M. 46	410.2943
	Top of cap over same	355.2197	Do.	T. B. M. 48	405.0668
Near Old Fort Ripley, Minn.	P. B. M. 268	353.8185	Do.	T. B. M. 49	407.5496
	Top of cap over same	355.0292	Near Hackensack, Minn.	T. B. M. 50	412.1626
Near Island No. 22, Minn.	P. B. M. 269	361.0202	Do.	T. B. M. 52	422.9673
	Top of cap over same	362.2305	Hackensack, Minn.	P. B. M. Hackensack	422.9379
Near Old Crow Wing Ferry, Minn.	P. B. M. 270	362.0783		Top of cap over same	424.1525
	Top of cap over same	363.2499	Do.	T. B. M. 53	423.2908
Do.	P. B. M. 271	359.0291	Near Hackensack, Minn.	T. B. M. 54	431.4163
	Top of cap over same	360.2391	Do.	T. B. M. 55	433.9323
Near Brainerd, Minn.	P. B. M. 272	363.5500	Do.	T. B. M. 56	426.8450
	Top of cap over same	364.7586	Lothrop, Minn.	T. B. M. 57	425.7569
Do.	T. B. M. 195	377.5977		P. B. M. Portage Lake	423.9432
Do.	T. B. M. 196	372.6721	Near Hunters, Minn.	Top of cap over same	425.0572
Brainerd, Minn.	P. B. M. 273	370.8317	Hunters, Minn.	T. B. M. 60	423.3206
	Top of cap over same	372.0410	Near Hunters, Minn.	T. B. M. 62	409.2054
Do.	P. B. M. Sanitarium	368.5890	Near Walker, Minn.	T. B. M. 63	400.7417
	Top of cap over same	369.8320	Do.	T. B. M. 64	397.9280
Do.	P. B. M. South Base	369.8630	Do.	T. B. M. 65	399.3662
	Top of cap over same	371.0751	Walker, Minn.	P. B. M. Walker	402.9636
Do.	P. B. M. North Base	367.1632		Top of cap over same	404.1697
	Top of cap over same	368.3786	Do.	P. B. M. Cole	402.4149
Do.	P. B. M. 274	367.6672	Do.	P. B. M. Water Tank	414.1514
	Top of cap over same	368.8752	Near Walker, Minn.	T. B. M. 69	404.4349
Near Brainerd, Minn.	P. B. M. 275	370.7635	Do.	T. B. M. 71	399.3917
	Top of cap over same	371.9768	Do.	T. B. M. 72	398.1213
Near mouth of Rabbit River, Minn.	P. B. M. 276	368.6844	Do.	R. R. B. M.	397.1787
	Top of cap over same	369.8902	Near Leech Lake, Minn.	T. B. M. 73	405.6541
Do.	P. B. M. 277	378.0989		P. B. M. Leech Lake	406.3906
	Top of cap over same	379.3058	Leech Lake, Minn.	Top of cap over same	407.5954
Near Old Indian Mission, Minn.	P. B. M. 278	359.5737	Near Leech Lake, Minn.	T. B. M. 77	400.9354
	Top of cap over same	360.7824	Near Wilkinson, Minn.	T. B. M. 78	399.5880
Near mouth of Pine River, Minn.	P. B. M. 279	364.6792	Do.	T. B. M. 79	397.3717
	Top of cap over same	365.8888	Do.	T. B. M. 80	397.9258
Near Island Lake, Minn.	P. B. M. 280	362.5819	Do.	T. B. M. 81	401.3688
	Top of cap over same	363.7858	Do.	T. B. M. 82	396.8401
Near Towhead Rapids, Minn.	P. B. M. 281	364.3680	Do.	T. B. M. 83	398.2409
	Top of cap over same	365.5789		P. B. M. Steamboat Lake	398.2185
Near Island No. 1, Minn.	P. B. M. 282	367.8669	Do.	Top of cap over same	399.4254
	Top of cap over same	369.0783	Do.	T. B. M. 85	400.5197
Near Dean Brook, Minn.	P. B. M. 283	369.5003	Do.	T. B. M. 86	407.5412
	Top of cap over same	370.7105	Near Cass Lake, Minn.	T. B. M. 87	408.1551
Near mouth of Hay Creek, Minn.	P. B. M. 284	367.6647	Do.	T. B. M. 89	409.1852
	Top of cap over same	368.8740	Do.	T. B. M. 90	406.1692
Near mouth of Cedar Brook, Minn.	P. B. M. 285	365.2587			
	Top of cap over same	366.4696			
Near Aitkin, Minn.	P. B. M. 286	365.3969			
	Top of cap over same	366.6030			
Aitkin, Minn.	P. B. M. Court-house	370.8103	Cass Lake, Minn.	P. B. M. Wye	406.0713
				Top of cap over same	407.2863

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Cass Lake, Minn.	T. B. M. 93	402.5766	Near Ball Club, Minn.	(B. M. Tomahawk	397.2439
Near Farris, Minn.	T. B. M. 94	410.0573		Top of cap over same.	398.4471
Do.	T. B. M. 97	413.2801		(B. M. Wigwam	393.0112
Do.	(P. B. M. Midge Lake	404.9675	Do.	Top of cap over same.	394.2260
Do.	Top of cap over same.	406.1771	Do.	T. B. M. 15 C.	391.7584
Do.	T. B. M. 101	404.9795	Near Starke, Minn.	(Starke A.	391.0800
Near Rosby, Minn.	T. B. M. 102	406.3022		Top of cap over same.	393.1931
Do.	T. B. M. 103	408.3950	Starke, Minn.	T. B. M. 200	393.9673
Near South Bemidji, Minn.	T. B. M. 105	411.5345	Near Starke, Minn.	T. B. M. 202	397.1341
Do.	T. B. M. 107	414.5907	Near Deer River, Minn.	T. B. M. 203	397.2508
Do.	T. B. M. 108	415.0395		(Old Road A.	394.2993
Near Bemidji, Minn.	(Bemidji A.	415.6820	Do.	Top of cap over same.	395.5079
	Top of cap over same.	416.8955	Deer River, Minn.	T. B. M. 206	394.3749
Bemidji, Minn.	T. B. M. 111	411.5916	Do.	(Deer River A.	395.7048
Do.	(P. B. M. Willets	414.2876		Top of cap over same.	396.9247
Do.	Top of cap over same.	415.4978	Do.	(B. M. Roundhouse	393.4347
Do.	P. B. M. Bemidji	415.3318		Top of cap over same.	394.6332
	Tank.		Near Deer River, Minn.	(U. S. E. B. M. 192	391.6377
Near Bemidji, Minn.	T. B. M. 114	416.7364		Top of cap over same.	392.8350
Do.	P. B. M. Dorman	419.4618	Do.	U. S. Engineer gauge.	390.7406
	Top of cap over same.	420.6734	Do.	T. B. M. 208	391.1031
Do.	P. B. M. Collette	415.5562	Near Hull, Minn.	T. B. M. 210	392.3404
	Top of cap over same.	416.7702	Do.	T. B. M. 212	400.8613
Near Maltby, Minn.	(County line A.	447.7901	Do.	T. B. M. 213	391.1015
	Top of cap over same.	449.0062	Near Cohasset, Minn.	(B. M. Cohasset	390.4574
Near mouth of Hennepin River, Minn.	P. B. M. Hennepin	421.8185		Top of cap over same.	391.6662
	Top of cap over same.	423.0310	Cohasset, Minn.	T. B. M. 215	391.0467
Near "The Rapids," Minn.	P. B. M. Rapids	426.0401	Do.	(U. S. E. B. M. 166	389.8770
	Top of cap over same.	427.2904		Top of cap over same.	391.0720
Near mouth of La Salle River, Minn.	P. B. M. La Salle	431.3517	Near Cohasset, Minn.	(B. M. Dam	393.0672
	Top of cap over same.	432.5435		Top of cap over same.	394.2786
On Prospect Hill, Minn.	Prospect Hill A.	512.4554	Near Pokegama Dam, Minn.	Old U. S. B. M.	390.4490
	Top of cap over same.	513.6726			
Near Lake Itasca, Minn.	P. B. M. Sherratt	453.7044	Pokegama Dam, Minn.	P. B. M. Pokegama	392.5048
	Top of cap over same.	454.9231		Falls	
Do.	P. B. M. Park Line	451.7302		(U. S. E. B. M. 167	390.1287
	Top of cap over same.	452.9420	Near Pokegama Dam, Minn.	Top of cap over same.	391.3284
Do.	Itasca A.	467.0613	Pokegama Dam, Minn.	U. S. Engineer gauge.	390.2441
	Top of cap over same.	468.2770	Do.	do.	388.4132
Lake Itasca, Minn.	P. B. M. Park House	454.0838	Do.	do.	388.4205
	Top of cap over same.	455.2956	Near Grand Rapids, Minn.	(Grand Rapids A.	389.4473
				Top of cap over same.	390.5557
Cass Lake, Minn.	P. B. M. Roundhouse	404.1792	Do.	T. B. M. 220	392.9862
Do.	(U. S. E. B. M. 347	405.3211	Grand Rapids, Minn.	P. B. M. Balustrade	393.3994
	Top of cap over same.	406.5204		(Race track A.	389.4494
Near Cass Lake, Minn.	(U. S. E. B. M. 342	401.1292	Near Grand Rapids, Minn.	Top of cap over same.	390.6500
	Top of cap over same.	402.3265	Do.	(B. M. Grand Rapids	390.8617
Near Lomond, Minn.	T. B. M. 169	403.4674		Top of cap over same.	392.0724
	P. B. M. Lomond	399.4277	Near La Prairie, Minn.	P. B. M. Prairie River	391.5052
Lomond, Minn.	Spur.		Do.	(La Prairie A.	391.5263
	Top of cap over same.	400.6389	Do.	Top of cap over same.	395.3477
Near Lomond, Minn.	(U. S. E. B. M. 337		Do.	T. B. M. 226	397.4255
	Top of cap over same.	398.3843	Blackberry, Minn.	T. B. M. 229	397.2123
Cuba, Minn.	T. B. M. 170	410.4875	Do.	T. B. M. 230	396.3851
Near Cuba, Minn.	T. B. M. 172	408.7993		(B. M. Blackberry	397.5967
Near Schley, Minn.	T. B. M. 174	400.0342		Top of cap over same.	
Do.	T. B. M. 175	402.7639			
Do.	T. B. M. 176	405.6430			
Do.	T. B. M. 177	404.0682	Aitkin, Minn.	(P. B. M. 231	365.3380
Do.	T. B. M. 179	402.1407		Top of cap over same.	366.5492
Near Bena, Minn.	T. B. M. 181	401.6075	Near Aitkin, Minn.	(Lower Base	365.4018
Do.	T. B. M. 183	400.5738		Top of cap over same.	366.6156
	Bigosh A.	402.0627	Do.	(B. M. 231	365.3817
	Top of cap over same.	403.2773		Top of cap over same.	366.5957
Bena, Minn.	(Bena A.	401.6612	Do.	(U. S. E. B. M. 202	367.3389
	Top of cap over same.	402.8737		Top of cap on pipe	366.2854
Do.	R. R. B. M.	399.4445	Do.	P. B. M. Cut-off	367.5029
Near Bena, Minn.	(Norway Grove A.	403.0423		Top of cap over same.	366.5601
	Top of cap over same.	404.2502	Do.	P. B. M. Biggar	367.7740
Do.	T. B. M. 188	402.5680		Top of cap over same.	367.4062
Do.	R. R. B. M.	402.3618	Near Waldeck, Minn.	(P. B. M. Sutton	368.6256
Near Nushka, Minn.	T. B. M. 189	399.5442		Top of cap over same.	367.9843
Nushka, Minn.	T. B. M. 191	399.6466	Do.	(U. S. E. B. M. 209	369.1896
Near Nushka, Minn.	T. B. M. 192	403.0996		Top of cap over same.	368.2925
	(Divide A.	402.6405	Waldeck, Minn.	P. B. M. Waldeck	369.5041
	Top of cap over same.	403.8451		Top of cap over same.	368.6298
Do.	(B. M. Mississippi*	398.0316	Near Waldeck, Minn.	P. B. M. Fowlds	369.8462
	Top of cap over same.	399.2388	Do.	(P. B. M. Strand	369.2270
Near Ball Club, Minn.	(U. S. E. B. M. 304	394.4353		Top of cap over same.	370.4354
	Top of cap over same.	395.6316			

\* Moved by R. R. company in June, 1904; present elevation not determined.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Portage, Minn.	P. B. M. Carlson.....	373.7587	Rush City, Minn.	P. B. M. 23A.....	280.4082
	Top of cap over same..	374.9707	Do.	P. B. M. 24.....	280.3559
Do.	P. B. M. School.....	372.9147	Harris, Minn.	P. B. M. 25.....	273.7967
	Top of cap over same..	374.1266	Do.	P. B. M. 25A.....	275.0080
Do.	P. B. M. Pat.....	371.2762	North Branch, Minn.	P. B. M. 26.....	272.7576
	Top of cap over same..	372.4891	Do.	P. B. M. 27.....	272.2767
Near Libby, Minn.	P. B. M. Sandy.....	371.8829	Do.	P. B. M. 27A.....	273.4952
	Top of cap over same..	373.0911	Stacy, Minn.	P. B. M. 28.....	271.7940
Do.	U. S. E. B. M.....	371.4126	Do.	P. B. M. 28A.....	273.0083
	P. B. M. Big Lagoon..	373.4404	Wyoming, Minn.	P. B. M. 29.....	270.7016
Do.	Top of cap over same..	374.6593	Do.	P. B. M. 29A.....	271.9184
Do.	P. B. M. Midway.....	378.3293	Forest Lake, Minn.	P. B. M. 30.....	279.1169
	Top of cap over same..	379.5501	Do.	P. B. M. 31.....	277.5391
Do.	P. B. M. Wells.....	376.5674	Do.	P. B. M. 31A.....	278.7827
	Top of cap over same..	377.7785	Do.	P. B. M. 32.....	277.4884
Near Mississippi, Minn.	P. B. M. Stone.....	377.2291	Do.	P. B. M. 32A.....	278.7043
	Top of cap over same..	378.4427	Centerville, Minn.	P. B. M. 33.....	284.2207
Do.	P. B. M. Le Moon.....	379.3132	Do.	P. B. M. 33A.....	285.4384
	Top of cap over same..	380.5260	Bald Eagle Junction, Minn.	P. B. M. 34.....	283.1320
Do.	P. B. M. Tiessen.....	381.0494	Do.	P. B. M. 34A.....	284.3451
	Top of cap over same..	382.2647	White Bear, Minn.	P. B. M. 35.....	286.2942
Do.	P. B. M. Vicinity.....	382.9133	Do.	P. B. M. 36.....	285.3123
	Top of cap over same..	384.1244	Do.	P. B. M. 36A.....	286.5306
Do.	P. B. M. Shep.....	382.8670	Do.	P. B. M. 37.....	285.2551
	Top of cap over same..	384.0791	Do.	P. B. M. 37A.....	286.4709
Near Verna, Minn.	P. B. M. Split Hand..	385.5498	Near White Bear, Minn.	P. B. M. 38.....	282.3629
	Top of cap over same..	386.7674	Do.	P. B. M. 38A.....	283.5819
Near Blackberry, Minn.	P. B. M. Hamilton.....	386.4567	Do.	T. B. M. 185.....	275.5220
	Top of cap over same..	387.6721	Gladstone, Minn.	P. B. M. 39.....	273.7113
Do.	P. B. M. Five Pines..	390.7517	Do.	P. B. M. 39A.....	274.5883
	Top of cap over same..	391.9652	Do.	P. B. M. 40.....	272.9468
Do.	P. B. M. Strawberry..	395.6256	Do.	P. B. M. 40A.....	274.1564
	Top of cap over same..	396.8408	St. Paul, Minn.	T. B. M. 193.....	217.0271
Duluth, Minn.	B. M. 1 of U. S. Eng..	191.1611	Jefferson City, Mo.	City B. M.....	194.3466
Do.	B. M. 19 of U. S. Eng..	185.2349	Do.	T. B. M. 197.....	191.4757
Do.	B. M. 23 of U. S. Eng..	185.8116	Do.	P. B. M. 105.....	170.7503
West Duluth, Minn.	B. M. Iron Bay Iron	191.7072	Do.	T. B. M. 199.....	169.2441
	Works.....		Do.	T. B. M. 198—Old	165.2867
Near Duluth, Minn.	P. B. M. 1.....	193.6034	Do.	B. M. 90 (c).....	
Do.	P. B. M. 1A.....	194.8157	Do.	T. B. M. 200.....	170.0638
Smithville, Minn.	P. B. M. 2.....	214.3060	Do.	T. B. M. 201—Old	166.3066
Do.	P. B. M. 2A.....	215.5193	Do.	B. M. 90 (b).....	
Short Line Park, Minn.	P. B. M. 3.....	291.4107	Do.	P. B. M. 107— <sup>39</sup> .....	168.7795
Do.	P. B. M. 3A.....	292.6284	Do.	Top of cap over same..	170.0173
Thomson, Minn.	P. B. M. 4.....	326.3712	Near Jefferson City, Mo.	T. B. M. 202.....	170.8888
Do.	P. B. M. 4A.....	327.5832	Do.	P. B. M. 108.....	168.6069
Carlton, Minn.	P. B. M. 5.....	332.2194	Do.	Top of cap over same..	169.8457
Near Carlton, Minn.	P. B. M. 6.....	339.4509	Do.	T. B. M. 203—Old	169.1283
Do.	P. B. M. 6A.....	340.6648	Do.	B. M.....	
Near Barnum, Minn.	P. B. M. 7.....	332.6278	Do.	T. B. M. 204.....	169.6427
Do.	P. B. M. 7A.....	333.8462	Near Grays Creek, Mo.	P. B. M. 109.....	171.8298
Do.	P. B. M. 8.....	355.3715	Do.	P. B. M. 205.....	170.9059
Do.	P. B. M. 8A.....	356.5815	Do.	T. B. M. 206.....	171.0134
Do.	P. B. M. 9.....	360.2771	Grays Creek, Mo.	T. B. M. 207—Old	169.8564
Do.	P. B. M. 9A.....	361.5001	Do.	R. R. B. M.....	
Moose Lake, Minn.	P. B. M. 10.....	323.1439	Do.	P. B. M. 110— <sup>21</sup> .....	171.9437
Do.	P. B. M. 10A.....	324.3602	Do.	Top of cap over same..	173.1865
Sturgeon Lake, Minn.	P. B. M. 11.....	325.5608	Near Grays Creek, Mo.	T. B. M. 209.....	165.0485
Do.	P. B. M. 11A.....	326.7841	Near Claysville, Mo.	T. B. M. 213.....	168.6463
Willow River, Minn.	P. B. M. 12.....	313.2409	Do.	P. B. M. 111.....	169.3886
Do.	P. B. M. 12A.....	314.4554	Do.	P. B. M. 112.....	167.7710
Kettle River, Minn.	P. B. M. 13.....	314.2058	Do.	Top of cap over same..	169.0085
Do.	P. B. M. 13A.....	315.4208	Do.	P. B. M. 113— <sup>33</sup> .....	171.7215
Miller, Minn.	P. B. M. 14.....	344.4505	Do.	Top of cap over same..	172.9603
Do.	P. B. M. 14A.....	345.6626	Near Stanleys Landing, Mo.	T. B. M. 218.....	169.1275
Sandstone Junction, Minn.	P. B. M. 15.....	341.2393	Sugar Loaf Rock, Mo.	P. B. M. 114.....	173.6826
Do.	P. B. M. 15A.....	342.4583	Do.	P. B. M. 115.....	169.2341
Hinckley, Minn.	P. B. M. 16.....	313.8880	Near Marlon, Mo.	Top of cap over same..	170.4713
Do.	P. B. M. 17.....	314.1766	Do.	T. B. M. 220.....	170.8761
Do.	P. B. M. 17A.....	315.3965	Near Bull Rock, Mo.	T. B. M. 223.....	167.3166
Mission Creek, Minn.	P. B. M. 18.....	300.7938	Bull Rock, Mo.	P. B. M. 116.....	169.0827
Do.	P. B. M. 18A.....	302.0141	Do.	P. B. M. 117.....	174.4298
Browns Hill, Minn.	P. B. M. 19.....	296.8490	Do.	Top of cap over same..	175.6672
Do.	P. B. M. 19A.....	298.0678	Near Marlon, Mo.	T. B. M. 224.....	168.2886
Pine City, Minn.	P. B. M. 20.....	289.3136	Do.	T. B. M. 225.....	167.3149
Do.	P. B. M. 21.....	288.5309	Do.	T. B. M. 226.....	169.8795
Do.	P. B. M. 21A.....	289.7517	Do.	P. B. M. 118— <sup>43</sup> .....	175.0496
Brook Creek, Minn.	P. B. M. 22.....	284.9148	Marlon, Mo.	Top of cap over same..	176.2902
Do.	P. B. M. 22A.....	286.1347	Do.	P. B. M. 119.....	170.9942
Rush City, Minn.	T. B. M. 23.....	279.2819	Do.	T. B. M. 230.....	166.5677

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Marion, Mo.	T. B. M. 232	169.0020	Near Lisbon, Mo.	T. B. M. 301	184.5159
Moniteau Creek, Mo.	P. B. M. 120	172.5548	Do.	T. B. M. 302	185.2718
Near Sandy Hook Land- ing, Mo.	Top of cap over same	173.7957	Do.	T. B. M. 303	187.6661
Do.	T. B. M. 236	172.0435	Near Bluffport, Mo.	T. B. M. 304	186.4574
Sandy Hook Landing, Mo.	P. B. M. 121	171.0433	Near Richland Creek, Mo.	P. B. M. 155	186.5322
Do.	P. B. M. 122- <sup>3</sup> / <sub>4</sub>	177.2344	Top of cap over same	Top of cap over same	187.7707
Near Sandy Hook Land- ing, Mo.	Top of cap over same	178.4753	Near Bluffport, Mo.	P. B. M. 156	189.0313
Do.	P. B. M. 123	172.8371	Near Richland Creek, Mo.	T. B. M. 305	188.6501
Near Geigers Landing, Mo.	T. B. M. 240	171.5224	Near Glasgow, Mo.	P. B. M. 157- <sup>1</sup> / <sub>2</sub>	186.2132
Geigers Landing, Mo.	T. B. M. 241	169.9767	Do.	Top of cap over same	187.4515
Do.	P. B. M. 124	177.2697	Glasgow, Mo.	T. B. M. 309	186.1855
Do.	Top of cap over same	178.5069	Do.	P. B. M. 159- <sup>1</sup> / <sub>2</sub>	188.3771
Do.	P. B. M. 125	175.4896	Top of cap over same	P. B. M. 160	189.6134
Do.	T. B. M. 242	173.7879	Do.	T. B. M. 314	194.3942
Near Geigers Landing, Mo.	T. B. M. 243	174.3192	Do.	T. B. M. 315=Old	192.0270
Near Wolf Point, Mo.	P. B. M. 126- <sup>3</sup> / <sub>4</sub>	176.5359	Do.	B. M. 141(a)	187.2236
Do.	Top of cap over same	177.7753	Near Glasgow, Mo.	P. B. M. 161	202.3490
Wolf Point, Mo.	P. B. M. 127- <sup>3</sup> / <sub>4</sub>	179.0398	Do.	P. B. M. 158- <sup>1</sup> / <sub>2</sub>	188.5764
Do.	Top of cap over same	180.2803	Top of cap over same	P. B. M. 162	189.8146
Do.	T. B. M. 250	177.1845	Near Cambridge, Mo.	Top of cap over same	190.6871
Do.	P. B. M. 128	184.7692	Cambridge, Mo.	P. B. M. 163	191.9273
Mount Vernon Landing, Mo.	P. B. M. 129	179.2307	Do.	T. B. M. 325	194.4785
Do.	Top of cap over same	180.4669	Do.	P. B. M. 164- <sup>1</sup> / <sub>2</sub>	193.8399
Do.	P. B. M. 130	175.7731	Do.	Top of cap over same	191.3947
Near Terrapin Island, Mo.	P. B. M. 131- <sup>1</sup> / <sub>2</sub>	177.7423	Do.	T. B. M. 326	192.6306
Do.	Top of cap over same	178.9643	Near Salt Creek, Mo.	P. B. M. 165	192.5207
Near Rocheport, Mo.	P. B. M. 132	175.9460	Do.	P. B. M. 166- <sup>1</sup> / <sub>2</sub>	188.8770
Do.	Top of cap over same	177.1833	New Frankfort, Mo.	Top of cap over same	190.1142
Near Overton, Mo.	P. B. M. 133- <sup>3</sup> / <sub>4</sub>	180.8560	Do.	P. B. M. 167	191.0119
Near Boonville, Mo.	Top of cap over same	182.0986	Near New Frankfort, Mo.	Top of cap over same	192.2547
Do.	P. B. M. 134	179.7284	Do.	P. B. M. 168- <sup>1</sup> / <sub>2</sub>	191.0732
Near Elliotts Landing, Mo.	P. B. M. 135	179.1645	Near Buckhorn Point, Mo.	Top of cap over same	192.3094
Do.	Top of cap over same	180.4019	Do.	P. B. M. 169	192.1195
Elliots Landing, Mo.	P. B. M. 136	181.3869	Top of cap over same	P. B. M. 170	193.3608
Do.	P. B. M. 137- <sup>3</sup> / <sub>4</sub>	182.3527	Cromwell Point, Mo.	P. B. M. 171- <sup>1</sup> / <sub>2</sub>	193.0356
Do.	Top of cap over same	183.5902	Do.	Top of cap over same	194.2754
Near Franklin Island, Mo.	T. B. M. 271	175.9980	Near Grand River, Mo.	P. B. M. 170- <sup>1</sup> / <sub>2</sub>	193.6590
Near Boonville, Mo.	P. B. M. 138	178.4695	Do.	Top of cap over same	194.8983
Do.	P. B. M. 139	177.4318	Near Dewitt, Mo.	P. B. M. 171- <sup>1</sup> / <sub>2</sub>	193.9093
Do.	Top of cap over same	178.6749	Do.	Top of cap over same	195.1454
Do.	T. B. M. 276	178.4981	Near Miami, Mo.	P. B. M. 172	194.7090
Do.	P. B. M. 140- <sup>1</sup> / <sub>2</sub>	179.1993	Do.	Top of cap over same	195.9505
Boonville, Mo.	Top of cap over same	180.4357	Do.	P. B. M. 173	195.8257
Do.	T. B. M. 279	182.8273	Do.	T. B. M. 357-B. M. C.	196.9851
Do.	Highwater mark, 1844 (Main street).	182.6494	of 1878.		
Do.	P. B. M. 141	178.9417	Miami, Mo.	P. B. M. 175- <sup>1</sup> / <sub>2</sub>	196.5554
Do.	P. B. M. 142-40 <sup>1</sup> / <sub>2</sub>	181.6864	Do.	Top of cap over same	197.7968
Do.	U. S. Signal Service gauge.	172.5773	Do.	T. B. M. 358	197.7183
Do.	Highwater mark, 1844 (Bridge).	182.5960	Near Miami, Mo.	P. B. M. 176	195.3549
Do.	P. B. M. 141	181.8914	Do.	T. B. M. 359	194.6958
Do.	P. B. M. 142-40 <sup>1</sup> / <sub>2</sub>	181.6864	Do.	T. B. M. 360	198.3831
Do.	Boonville.		Do.	P. B. M. 177- <sup>1</sup> / <sub>2</sub>	196.1679
Do.	Top of cap over same	182.9278	Top of cap over same	Top of cap over same	197.4108
Do.	T. B. M. 280	186.2783	Near Teteseau Bend, Mo.	P. B. M. 178	197.3545
Do.	P. B. M. 143	186.2796	Do.	Top of cap over same	198.5862
Do.	P. B. M. 145	185.4122	Near Laynesville, Mo.	P. B. M. 179- <sup>1</sup> / <sub>2</sub>	198.6280
Do.	P. B. M. 146	180.9643	Do.	Top of cap over same	199.8686
Near Franklin, Mo.	Top of cap over same	182.2265	Malta Bend Landing, Mo.	P. B. M. 180	198.8737
Do.	P. B. M. 147- <sup>1</sup> / <sub>2</sub> (new position).	181.9231	Do.	Top of cap over same	200.1141
Near Boonville, Mo.	Top of cap over same	183.1589	Near Malta Bend Landing, Mo.	P. B. M. 181	199.5790
Do.	T. B. M. 286	183.9756	Do.	Top of cap over same	200.8177
Do.	P. B. M. 148	183.1140	Near Waverly, Mo.	P. B. M. 182- <sup>1</sup> / <sub>2</sub>	200.9000
Do.	Top of cap over same	184.3531	Do.	Top of cap over same	202.1436
Near Lisbon, Mo.	P. B. M. 149	184.2816	Do.	P. B. M. 183	205.5002
Do.	Top of cap over same	185.6189	Do.	Top of cap over same	206.7399
Do.	P. B. M. 150	183.6760	Do.	T. B. M. 389	204.9318
Do.	P. B. M. 151- <sup>1</sup> / <sub>2</sub>	189.0209	Do.	P. B. M. 184- <sup>1</sup> / <sub>2</sub>	201.0502
Do.	Top of cap over same	190.2598	Do.	Top of cap over same	202.2913
Do.	T. B. M. 295	183.7259	Do.	T. B. M. 392	207.1753
Do.	P. B. M. 152- <sup>1</sup> / <sub>2</sub>	187.3235	Waverly, Mo.	P. B. M. 185- <sup>1</sup> / <sub>2</sub>	208.7770
Do.	Top of cap over same	188.5633	Do.	Top of cap over same	210.0244
Do.	T. B. M. 297	188.6053	Near Waverly, Mo.	P. B. M. 186	205.0701
Do.	P. B. M. 153	185.1117	Do.	T. B. M. 396	206.4859
Do.	T. B. M. 300	184.5320	Do.	P. B. M. 187	205.9453
Do.	P. B. M. 154- <sup>1</sup> / <sub>2</sub>	183.0947	Do.	T. B. M. 397	206.4894
Do.	Top of cap over same	184.3186	Do.	P. B. M. 188	205.7612
			Do.	Top of cap over same	206.9666
			Do.	P. B. M. 189- <sup>1</sup> / <sub>2</sub>	212.7253
			Near Edwards, Mo.	Top of cap over same	213.9650
			Do.	P. B. M. 190	209.5278
			Edwards, Mo.	T. B. M. 402	208.9936
				P. B. M. 191	208.3125

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Edwards, Mo.	(P. B. M. 192.....	205.6791	Near Independence, Mo.	(P. B. M. 223 = <sup>7</sup> / <sub>1</sub> .....	223.4366
Do.	(Top of cap over same.	206.9224	Wayne, Mo.	(Top of cap over same.	224.6779
Near Dover, Mo.	(P. B. M. 193 = <sup>10</sup> / <sub>1</sub> .....	206.8874	Near Wayne, Mo.	(P. B. M. 224.....	227.5899
Do.	(Top of cap over same.	207.6546	Near Independence, Mo.	(P. B. M. 225.....	228.2126
Do.	(P. B. M. 407.....	208.8941	Big Blue River, Mo.	(Top of cap over same.	229.4487
Do.	(P. B. M. 408.....	207.6718	Near Independence, Mo.	(P. B. M. 226.....	226.6773
Dover, Mo.	(P. B. M. 194.....	208.3274	Do.	(P. B. M. 227.....	224.0667
Berlin, Mo.	(Top of cap over same.	206.5614	Near Kansas City, Mo.	(Top of cap over same.	225.3041
Do.	(P. B. M. 195 = <sup>10</sup> / <sub>1</sub> .....	207.8014	Kansas City, Mo.	(P. B. M. 228 = <sup>7</sup> / <sub>1</sub> .....	223.9792
Do.	(Top of cap over same.	208.1365	Do.	(Top of cap over same.	225.2198
Do.	(P. B. M. 196.....	209.3721	Do.	(T. B. M. 478 = Old	226.2991
Near Northrup, Mo.	(P. B. M. 411.....	208.9054	Do.	(B. M. 240.....	
Do.	(P. B. M. 197.....	209.5321	Do.	(T. B. M. 479.....	228.2339
Do.	(P. B. M. 412.....	208.0005	Do.	(P. B. M. 229.....	228.4001
Northrup, Mo.	(P. B. M. 198.....	208.2618	Do.	(T. B. M. 480 = Old	233.7117
Near Northrup, Mo.	(P. B. M. 198.....	210.1151	Do.	(B. M. 242.....	
Near Lexington, Mo.	(Top of cap over same.	211.3508	Do.	(P. B. M. 230 = <sup>7</sup> / <sub>1</sub> .....	227.5485
Do.	(T. B. M. 415.....	210.9414	Do.	(Top of cap over same.	228.7930
Near Lexington, Mo.	(P. B. M. 199 = <sup>10</sup> / <sub>1</sub> .....	206.2915	Do.	(T. B. M. 481.....	229.5245
Do.	(Top of cap over same.	207.5363	Do.	(P. B. M. 233.....	228.8980
Do.	(T. B. M. 419.....	212.0029	Do.	(T. B. M. 482.....	228.0311
Do.	(P. B. M. 200.....	212.3992	Kansas City, Kans.	(P. B. M. 234.....	229.7004
Do.	(T. B. M. 420.....	214.8700	Do.	(T. B. M. 483.....	228.4346
Do.	(P. B. M. 201.....	213.1816	Do.	(P. B. M. 235.....	226.1700
Do.	(Top of cap over same.	214.4222	Do.	(T. B. M. 484.....	225.6386
Do.	(P. B. M. 202.....	212.1911	Do.	(T. B. M. 485 = Old	237.1441
Do.	(T. B. M. 422.....	210.6094	Do.	(B. M. 248.....	
Lexington, Mo.	(P. B. M. 203 = <sup>10</sup> / <sub>1</sub> .....	209.8279	Do.	(T. B. M. 486 = City B. M.	237.4088
Do.	(Top of cap over same.	211.0679	Do.	(T. B. M. 487.....	232.5670
Do.	(T. B. M. 423.....	211.2079	Do.	(P. B. M. 236.....	228.5756
Do.	(P. B. M. 204.....	209.7706	Do.	(Top of cap over same.	229.8138
Do.	(T. B. M. 424.....	209.5176	Do.	(P. B. M. 237.....	229.4387
Do.	(P. B. M. 205 = Old	219.5470	Near Quindaro, Kans.	(P. B. M. 238 = <sup>7</sup> / <sub>1</sub> .....	227.7137
Near Lexington, Mo.	(H. M. 190.....		Do.	(Top of cap over same.	228.9542
Do.	(T. B. M. 425 = Old	212.3973	Do.	(T. B. M. 492.....	235.7624
Do.	(B. M. 191.....		Near Nearman, Kans.	(P. B. M. 239.....	227.8541
Do.	(P. B. M. 206.....	211.5540	Near Pomeroy, Kans.	(Top of cap over same.	229.0658
Do.	(P. B. M. 207.....	211.2121	Do.	(P. B. M. 240.....	231.1345
Near Wellington, Mo.	(Top of cap over same.	212.4528	Do.	(T. B. M. 195.....	231.1345
Do.	(P. B. M. 208.....	212.5194	Do.	(P. B. M. 241.....	230.5558
Do.	(Top of cap over same.	213.7522	Pomeroy, Kans.	(Top of cap over same.	231.7923
Do.	(T. B. M. 429 = Old	212.4300	Do.	(P. B. M. 242.....	236.3381
Do.	(B. M. 194.....		Do.	(P. B. M. 243.....	229.7271
Do.	(P. B. M. 209 = <sup>10</sup> / <sub>1</sub> .....	214.5499	Do.	(Top of cap over same.	230.9601
Wellington, Mo.	(Top of cap over same.	215.7935	Near Pomeroy, Kans.	(P. B. M. 244 = Old	236.0334
Do.	(P. B. M. 210.....	218.4949	Do.	(B. M. 260.....	
Do.	(T. B. M. 431.....	219.3225	Do.	(T. B. M. 499.....	229.8896
Near Waterloo, Mo.	(P. B. M. 211.....	212.1935	Connors, Kans.	(P. B. M. 245 = <sup>7</sup> / <sub>1</sub> .....	230.1284
Napoleon, Mo.	(Top of cap over same.	213.4292	Do.	(Top of cap over same.	231.3697
Near Napoleon, Mo.	(P. B. M. 212 = <sup>10</sup> / <sub>1</sub> .....	215.5732	Do.	(P. B. M. 246.....	235.3732
Do.	(Top of cap over same.	216.8139	Near Connors, Kans.	(P. B. M. 247.....	230.4364
Do.	(T. B. M. 436.....	219.6700	Do.	(Top of cap over same.	231.6708
Do.	(P. B. M. 213.....	215.5086	Popes, Kans.	(T. B. M. 506.....	232.3404
Near Sibley Bridge, Mo.	(Top of cap over same.	216.7457	Near Leavenworth Junction, Kans.	(P. B. M. 248 = <sup>7</sup> / <sub>1</sub> .....	243.8056
Matthews Landing, Mo.	(P. B. M. 214 = <sup>7</sup> / <sub>1</sub> .....	216.7876	Leavenworth Junction, Kans.	(Top of cap over same.	245.0486
Do.	(Top of cap over same.	218.0278	Do.	(P. B. M. 249.....	230.6845
Near Sibley, Mo.	(T. B. M. 445 = Old	218.7843	Near Leavenworth, Kans.	(Top of cap over same.	231.9234
Do.	(B. M. 210.....		Do.	(T. B. M. 513.....	232.7600
Near Sibley, Mo.	(P. B. M. 215.....	218.1021	Do.	(T. B. M. 514.....	234.9838
Sibley, Mo.	(Top of cap over same.	219.3374	Do.	(P. B. M. 250 = <sup>7</sup> / <sub>1</sub> .....	246.3674
Near Sibley, Mo.	(P. B. M. 216.....	227.5784	Do.	(Top of cap over same.	247.6065
Do.	(P. B. M. 217 = Cap over	216.0916	Do.	(T. B. M. 515.....	234.0135
Near New Sibley, Mo.	(P. B. M. 218.....	217.4957	Leavenworth, Kans.	(P. B. M. 251.....	238.4454
Do.	(Top of cap over same.	218.7288	Do.	(P. B. M. 252.....	239.9194
Do.	(T. B. M. 457.....	223.1245	Do.	(T. B. M. 516 = Old	234.5631
Do.	(T. B. M. 458.....	223.7679	Do.	(B. M. 270.....	
Near Missouri City, Mo.	(P. B. M. 219 = <sup>10</sup> / <sub>1</sub> .....	218.5220	Do.	(P. B. M. 253.....	236.3451
Atherton, Mo.	(Top of cap over same.	219.7649	Do.	(T. B. M. 517.....	235.2493
Do.	(P. B. M. 220.....	222.3738	Near Leavenworth, Kans.	(T. B. M. 518.....	237.4057
Near Atherton, Mo.	(Top of cap over same.	222.6108	Do.	(P. B. M. 254 = <sup>7</sup> / <sub>1</sub> .....	240.2521
Do.	(P. B. M. 221.....	224.7258	Fort Leavenworth, Kans.	(Top of cap over same.	241.4974
Do.	(Top of cap over same.	225.9586	Do.	(P. B. M. 255.....	240.3909
Blue Mills Landing, Mo.	(T. B. M. 465.....	227.9367	Do.	(T. B. M. 520.....	238.4393
Do.	(T. B. M. 466 = Old	223.4079	Do.	(T. B. M. 521 = gauge	239.5162
Do.	(B. M. 33 of 1878.		Do.	(B. M. ....	
Do.	(T. B. M. 467 = Old	220.9091	Do.	(P. B. M. 256.....	236.5791
Do.	(B. M. 228.....		Near Fort Leavenworth, Kans.	(P. B. M. 257.....	235.7691
Courtney, Mo.	(P. B. M. 222.....	223.4524	Do.	(Top of cap over same.	237.0089
Near Courtney, Mo.	(Top of cap over same.	224.6840	Do.	(P. B. M. 258 = <sup>10</sup> / <sub>1</sub> .....	234.5016
Near Independence, Mo.	(T. B. M. 470.....	226.2789	Do.	(Top of cap over same.	235.7448
Do.	(T. B. M. 471.....	229.8916	Near Wade, Kans.	(T. B. M. 525.....	235.8880

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Kickapoo, Kans.	(P. B. M. 259.....	235.9052	Near Amazonia, Mo.	(P. B. M. 294— <sup>1</sup> / <sub>2</sub> .....	254.1494
Do.	(Top of cap over same..	237.1416	Do.	(Top of cap over same..	255.3595
Do.	(P. B. M. 260.....	242.2159	Near Nodaway, Mo.	(P. B. M. 295.....	253.7289
Do.	(T. B. M. 529—Old	242.3403	Do.	(P. B. M. 296— <sup>2</sup> / <sub>3</sub> .....	257.2739
Do.	(B. M. 278.....		Do.	(Top of cap over same..	258.4841
Do.	(T. B. M. 530.....	241.7698	Near Forbes, Mo.	(P. B. M. 297.....	255.7506
Kickapoo, Kans.	(P. B. M. 261— <sup>1</sup> / <sub>2</sub> .....	244.3182	Do.	(Top of cap over same..	256.9564
Do.	(Top of cap over same..	245.5564	Do.	(P. B. M. 298— <sup>1</sup> / <sub>3</sub> .....	260.4063
Do.	(T. B. M. 531.....	242.9940	Near Curzons, Mo.	(Top of cap over same..	261.7010
Near Oak Mills, Kans.	(P. B. M. 262.....	236.1099	Do.	(P. B. M. 299.....	257.6057
Oak Mills, Kans.	(Top of cap over same..	237.3411	Do.	(Top of cap over same..	258.8363
Do.	(P. B. M. 263.....	240.9053	Do.	(P. B. M. 300— <sup>1</sup> / <sub>2</sub> .....	258.5332
Do.	(P. B. M. 264— <sup>2</sup> / <sub>3</sub> .....	238.0749	Near Forest City, Mo.	(Top of cap over same..	259.7463
Near Oak Mills, Kans.	(Top of cap over same..	239.3141	Do.	(T. B. M. 632.....	260.4780
Do.	(P. B. M. 265.....	239.4365	Do.	(P. B. M. 301— <sup>1</sup> / <sub>2</sub> .....	262.9080
Do.	(Top of cap over same..	240.6673	Forest City, Mo.	(Top of cap over same..	264.1181
Do.	(T. B. M. 540.....	239.5678	Near Forest City, Mo.	(P. B. M. 302.....	261.8253
Near Atchison, Kans.	(P. B. M. 266— <sup>1</sup> / <sub>2</sub> .....	239.2094	Do.	(P. B. M. 303.....	259.1116
Do.	(Top of cap over same..	240.4364	Do.	(Top of cap over same..	260.3357
Do.	(T. B. M. 542.....	240.2638	Napier, Mo.	(P. B. M. 304.....	258.2194
Do.	(P. B. M. 267.....	242.7299	Do.	(Top of cap over same..	259.4508
Do.	(Top of cap over same..	243.9680	Near Bigelow, Mo.	(P. B. M. 305.....	258.6854
Do.	(T. B. M. 543.....	240.9148	Do.	(Top of cap over same..	259.9098
Do.	(P. B. M. 268—Old	243.6486	Bigelow, Mo.	(P. B. M. 306.....	260.6382
Do.	(B. M. 287.....		Do.	(Top of cap over same..	261.8655
Atchison, Kans.	(P. B. M. 269— <sup>1</sup> / <sub>2</sub> .....	243.3930	Near Bigelow, Mo.	(P. B. M. 307.....	261.3112
Do.	(Top of cap over same..	244.6189	Do.	(Top of cap over same..	262.5405
Do.	(T. B. M. 548—City B. M.	244.3923	Near Craig, Mo.	(P. B. M. 308.....	263.4939
Do.	(P. B. M. 270.....	255.8916	Do.	(P. B. M. 309.....	263.5551
Do.	(T. B. M. 549.....	255.1507	Do.	(Top of cap over same..	264.7786
Do.	(T. B. M. 550—Old	241.1843	Do.	(P. B. M. 310.....	264.2565
Do.	(gauge B. M. ....		Near Corning, Mo.	(P. B. M. 311.....	264.4301
Do.	(P. B. M. 271.....	243.4919	Do.	(Top of cap over same..	265.6574
Do.	(P. B. M. 272.....	242.7537	Corning, Mo.	(P. B. M. 312.....	266.8910
Do.	(T. B. M. 551.....	243.2294	Do.	(P. B. M. 313.....	266.6210
Near East Atchison, Mo.	(P. B. M. 273— <sup>1</sup> / <sub>2</sub> .....	238.7220	Near Corning, Mo.	(Top of cap over same..	267.8424
Do.	(Top of cap over same..	239.9512	Do.	(P. B. M. 314.....	266.2175
Near Rushville, Mo.	(P. B. M. 274.....	240.5943	Nishnabotna, Mo.	(Top of cap over same..	267.4428
Do.	(Top of cap over same..	241.6220	Near Nishnabotna, Mo.	(P. B. M. 315.....	269.4528
Rushville, Mo.	(P. B. M. 275— <sup>1</sup> / <sub>2</sub> .....	245.9170	Do.	(P. B. M. 316.....	269.2197
Do.	(Top of cap over same..	247.1463	Near Langdon, Mo.	(Top of cap over same..	270.4458
Near Halls, Mo.	(P. B. M. 276— <sup>1</sup> / <sub>2</sub> .....	245.8115	Do.	(P. B. M. 317.....	269.7963
Do.	(Top of cap over same..	247.0434	Near Phelps, Mo.	(Top of cap over same..	271.0231
Halls, Mo.	(P. B. M. 277.....	243.4046	Do.	(P. B. M. 318— <sup>1</sup> / <sub>2</sub> .....	270.7065
Do.	(Top of cap over same..	244.6418	Phelps, Mo.	(Top of cap over same..	271.9294
Near Kenmoor, Mo.	(P. B. M. 278— <sup>1</sup> / <sub>2</sub> .....	249.4139	Do.	(P. B. M. 319.....	271.3582
Do.	(Top of cap over same..	250.6426	Near Watson, Mo.	(Top of cap over same..	272.5859
Near St. Joseph, Mo.	(P. B. M. 279.....	245.6174	Do.	(P. B. M. 320— <sup>1</sup> / <sub>2</sub> .....	273.4829
Do.	(Top of cap over same..	246.8600	Do.	(Top of cap over same..	274.7048
Do.	(P. B. M. 280— <sup>1</sup> / <sub>2</sub> .....	251.6506	Watson, Mo.	(P. B. M. 321.....	272.8294
Do.	(Top of cap over same..	252.8829	Do.	(Top of cap over same..	274.0525
St. George, Mo.	(P. B. M. 281.....	251.4013	Near Watson, Mo.	(P. B. M. 322.....	275.0777
Do.	(Top of cap over same..	252.6359	Do.	(Top of cap over same..	276.3043
Do.	(T. B. M. 579.....	250.5361	Near Hamburg, Iowa.	(P. B. M. 323.....	277.1263
St. Joseph, Mo.	(T. B. M. 580.....	252.0394	Do.	(P. B. M. 324.....	275.5099
Do.	(P. B. M. 282.....	250.1940	Do.	(Top of cap over same..	276.7379
Do.	(T. B. M. 582—Old	251.1655	Do.	(P. B. M. 325— <sup>1</sup> / <sub>2</sub> .....	276.2775
Do.	(B. M. 313.....		Do.	(Top of cap over same..	277.4936
Do.	(T. B. M. 583—Old	250.9447	Near Nebraska City Junction, Iowa.	(P. B. M. 326.....	279.4329
Do.	(B. M. 312.....		Do.	(Top of cap over same..	280.6591
Do.	(P. B. M. 283— <sup>1</sup> / <sub>2</sub> .....	250.0992	Do.	(P. B. M. 327.....	280.5890
Do.	(Top of cap over same..	251.3252	Near Percival, Iowa.	(P. B. M. 328.....	281.8153
Do.	(P. B. M. 284.....	253.8766	Do.	(Top of cap over same..	280.7422
Do.	(T. B. M. 584.....	252.9902	Do.	(P. B. M. 329.....	281.9681
Do.	(P. B. M. 285.....	246.6799	Percival, Iowa.	(Top of cap over same..	282.5836
Do.	(P. B. M. 286.....	256.5739	Do.	(P. B. M. 330— <sup>1</sup> / <sub>2</sub> .....	283.8114
Do.	(T. B. M. 585—City B. M.	255.3302	Near McPaul, Iowa.	(Top of cap over same..	284.1613
Do.	(T. B. M. 586.....	252.5701	Do.	(Top of cap over same..	285.3778
Near St. Joseph, Mo.	(P. B. M. 287— <sup>1</sup> / <sub>2</sub> .....	249.1396	Do.	(P. B. M. 331.....	285.8445
Do.	(Top of cap over same..	250.3635	Do.	(Top of cap over same..	287.0685
Do.	(P. B. M. 288.....	247.8036	Near Bartlett, Iowa.	(P. B. M. 332.....	286.2768
Do.	(Top of cap over same..	249.0369	Do.	(Top of cap over same..	287.5006
Do.	(T. B. M. 589.....	250.0905	Do.	(P. B. M. 333.....	287.2739
Do.	(P. B. M. 289.....	251.0774	Near Haynies, Iowa.	(Top of cap over same..	288.4984
Do.	(P. B. M. 290— <sup>1</sup> / <sub>2</sub> .....	250.1288	Do.	(P. B. M. 334— <sup>1</sup> / <sub>2</sub> .....	288.1866
Do.	(Top of cap over same..	251.3167	Near Haynies, Iowa.	(Top of cap over same..	289.4077
Near Amazonia, Mo.	(P. B. M. 291.....	254.6944	Do.	(P. B. M. 335.....	289.1497
Do.	(Top of cap over same..	255.9202	Near Pacific Junction, Iowa.	(Top of cap over same..	290.3727
Do.	(P. B. M. 292— <sup>1</sup> / <sub>2</sub> .....	253.1164	Do.	(P. B. M. 336— <sup>1</sup> / <sub>2</sub> .....	289.7072
Do.	(Top of cap over same..	254.3282	Do.	(Top of cap over same..	290.6320
Do.	(P. B. M. 293.....	252.2237	Do.	(P. B. M. 337.....	291.3445
Do.	(Top of cap over same..	253.4488	Do.	(Top of cap over same..	292.5667



## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Hentons, Iowa.	P. B. M. 338.	282.2945	Near Whiting, Iowa.	P. B. M. 382.	323.5889
	Top of cap over same.	283.5219		Top of cap over same.	324.8127
Hentons, Iowa.	P. B. M. 339.	283.5831	Near Sloan, Iowa.	P. B. M. 383= $\frac{1}{2}$ "	324.3178
	Top of cap over same.	284.8053		Top of cap over same.	325.5559
Near Hentons, Iowa.	P. B. M. 340.	285.6577	Do.	P. B. M. 384.	325.9193
	Top of cap over same.	286.8805		Top of cap over same.	327.1394
Near Island Park, Iowa.	P. B. M. 341.	285.2642	Sloan, Iowa.	P. B. M. 385.	328.5243
	Top of cap over same.	286.4896		P. B. M. 386= $\frac{1}{2}$ "	326.3930
Near Council Bluffs, Iowa.	P. B. M. 342.	286.1028	Near Sloan, Iowa.	Top of cap over same.	327.6131
	Top of cap over same.	287.3252		P. B. M. 387.	327.0651
Council Bluffs, Iowa.	P. B. M. 343.	289.3172	Near Salix, Iowa.	Top of cap over same.	328.2918
Omaha, Nebr.	City B. M., Omaha.	317.5963	Do.	P. B. M. 388.	329.1682
Do.	P. B. M. 344.	317.2802		Top of cap over same.	330.3879
Do.	P. B. M. 345.	289.4639	Do.	P. B. M. 389.	331.2542
Do.	P. B. M. 346=gauge	286.4663		Top of cap over same.	332.4754
	B. M.		Near Sargents Bluff, Iowa.	P. B. M. 390.	331.1654
	Top of cap over same.	297.6753		Top of cap over same.	332.3993
Near Omaha, Nebr.	T. B. M. 804.	306.9172	Sargents Bluff, Iowa.	P. B. M. 391= $\frac{1}{2}$ "	332.6966
Council Bluffs, Iowa.	P. B. M. 347.	301.0153		Top of cap over same.	333.9129
Do.	P. B. M. 348= $\frac{1}{2}$ "	302.1646	Near Sargents Bluff, Iowa.	P. B. M. 392.	333.5421
	Top of cap over same.	303.3893		Top of cap over same.	334.7659
Do.	P. B. M. 349= $\frac{1}{2}$ "	297.6001	Sloux City, Iowa.	P. B. M. 393.	335.0668
	Top of cap over same.	298.8247		Top of cap over same.	336.2935
Near Council Bluffs, Iowa.	P. B. M. 350.	303.7752	Do.	P. B. M. 394.	337.3945
	Top of cap over same.	304.9962	Do.	T. B. M. 966.	338.2615
Do.	P. B. M. 351.	301.0718			
	Top of cap over same.	302.2956	Harrisburg, Pa.	P. R. R. 1.	97.5175
Crescent, Iowa.	P. B. M. 352.	301.5919	Do.	P. R. R. 2.	102.7335
	Top of cap over same.	302.8167	Do.	364 Harrisburg (1999).	110.8839
Near Honey Creek, Iowa.	P. B. M. 353.	303.9281	Do.	P. R. R. 4.	101.1243
Honey Creek, Iowa.	P. B. M. 354.	306.5852	Near Rockville, Pa.	P. R. R. 5.	106.4643
Near Honey Creek, Iowa.	P. B. M. 355.	305.3166	Do.	P. R. R. 6.	106.5009
	Top of cap over same.	306.5414	Near Perdix, Pa.	P. R. R. 7.	105.2658
Loveland, Iowa.	P. B. M. 356.	305.1600	Perdix, Pa.	P. R. R. 8.	106.0819
Near Missouri Valley, Iowa.	P. B. M. 357.	303.5996	Cove, Pa.	P. R. R. 9.	105.1705
	Top of cap over same.	304.8223	Near Cove, Pa.	P. R. R. 10.	106.2310
Missouri Valley, Iowa.	P. B. M. 358.	307.0923	Do.	P. R. R. 11.	105.7616
Near Missouri Valley, Iowa.	P. B. M. 359.	305.6264	Cove Creek, Pa.	P. R. R. 12.	107.1515
	Top of cap over same.	306.8508	Shermans Creek, Pa.	P. R. R. 13.	108.2754
Near California Junction, Iowa.	P. B. M. 360= $\frac{1}{2}$ "	305.8842	Duncannon, Pa.	P. R. R. 14.	111.8841
	Top of cap over same.	307.1053	Juniata Bridge, Pa.	P. R. R. B.	109.5032
Do.	P. B. M. 361.	306.7435	Near Juniata Bridge, Pa.	P. R. R. 15.	110.6246
	Top of cap over same.	307.9666	Near Aqueduct, Pa.	P. R. R. 16.	113.6543
Near Modale, Iowa.	P. B. M. 362.	307.7977	Aqueduct, Pa.	P. R. R. 17.	113.1269
	Top of cap over same.	309.0145	Alters Run Bridge, Pa.	P. R. R. 18.	114.9706
Do.	P. B. M. 363.	308.2191	Losh Run, Pa.	P. R. R. 19.	113.7906
	Top of cap over same.	309.4415	Near Losh Run, Pa.	P. R. R. 20.	117.5577
Near Mondamin, Iowa.	P. B. M. 364.	309.3420	Bailey, Pa.	P. R. R. 22.	117.2037
	Top of cap over same.	310.5661	Near Bailey, Pa.	P. R. R. 23.	120.4632
Mondamin, Iowa.	P. B. M. 365.	312.7710	Trimmers Rock, Pa.	P. R. R. 24.	119.6202
Near Mondamin, Iowa.	P. B. M. 366.	311.8443	Near Newport, Pa.	P. R. R. 25.	120.0984
	Top of cap over same.	313.0643	Newport, Pa.	P. R. R. 26.	120.7440
Do.	P. B. M. 367= $\frac{1}{2}$ "	311.3900	Near Newport, Pa.	P. R. R. 27.	120.8993
	Top of cap over same.	312.6071	Do.	P. R. R. 28.	122.3742
Near River Sloux, Iowa.	P. B. M. 368.	313.0214	Near Old Ferry Station, Pa.	P. R. R. 29.	122.0690
	Top of cap over same.	314.2417	Millerstown, Pa.	P. R. R. 31.	124.6989
Do.	P. B. M. 369= $\frac{1}{2}$ "	314.8923	Near Durward, Pa.	P. R. R. 32.	125.0307
	Top of cap over same.	316.1108	Durward, Pa.	P. R. R. 33.	128.8222
Do.	P. B. M. 370.	313.9606	Near Durward, Pa.	P. R. R. 34.	128.3892
	Top of cap over same.	315.1816	Thompsontown, Pa.	P. R. R. 35.	123.0289
Near Blencoe, Iowa.	P. B. M. 371.	314.6371	Near Thompsontown, Pa.	P. R. R. 36.	127.6174
	Top of cap over same.	315.8579	Do.	P. R. R. 37.	128.0650
Do.	P. B. M. 372= $\frac{1}{2}$ "		Vandyke, Pa.	P. R. R. C.	129.7289
	Top of cap over same.	314.8803	Near Vandyke, Pa.	P. R. R. 39.	129.7775
Do.	P. B. M. 373.	315.5535	Tuscarora, Pa.	P. R. R. 40.	131.0605
	Top of cap over same.	316.7736	Mexico, Pa.	P. R. R. 41.	130.7704
Blencoe, Iowa.	P. B. M. 374= $\frac{1}{2}$ "	316.4992	Near Port Royal, Pa.	P. R. R. 42.	131.8735
	Top of cap over same.	317.7158	Port Royal, Pa.	P. R. R. 43.	134.3726
Near Onawa, Iowa.	P. B. M. 375.	318.0370	Near Mifflin, Pa.	P. R. R. 45.	134.8657
	Top of cap over same.	319.2632	Mifflin, Pa.	P. R. R. 46.	135.5270
Do.	P. B. M. 376.	318.7228	Near Mifflin, Pa.	P. R. R. 47.	136.2156
	Top of cap over same.	319.9484	Denholm, Pa.	P. R. R. 49.	138.2724
Onawa, Iowa.	P. B. M. 377.	321.1402	Near Denholm, Pa.	P. R. R. 50.	141.9022
Do.	P. B. M. 378= $\frac{1}{2}$ "	319.6850	Near Narrows Station, Pa.	P. R. R. 51.	142.0383
	Top of cap over same.	320.9243	Do.	P. R. R. 52.	144.3424
Near Onawa, Iowa.	P. B. M. 379.	319.3661	Bixler Water Station, Pa.	P. R. R. 53.	145.1436
	Top of cap over same.	321.0649	Lewistown Junction, Pa.	P. R. R. 54.	151.8977
Near Whiting, Iowa.	P. B. M. 380.	320.7628	Mayes Bridge, Pa.	P. R. R. 57.	152.2752
	Top of cap over same.	321.9691	Granville, Pa.	P. R. R. 58.	150.4915
Do.	P. B. M. 381.	322.5544	Anderson, Pa.	P. R. R. 59.	150.2166
	Top of cap over same.	323.7954	Near Longfellow Station, Pa.	P. R. R. 61.	151.5479

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Horingford Station, Pa.	P. R. R. 62	152.4193	Near Ehrenfeld, Pa.	P. R. R. 18	452.2965
Do.	P. R. R. 63	156.5634	Conemaugh Viaduct, Pa.	P. R. R. 20	444.2738
McVeytown, Pa.	P. R. R. 64	160.1544	Mineral Point, Pa.	P. R. R. 21	431.5297
Near McVeytown, Pa.	P. R. R. 65	154.2227	Near Mineral Point, Pa.	P. R. R. 22a	414.8019
Do.	P. R. R. 66	154.3017	Do.	P. R. R. 23	404.3320
Near Ryde, Pa.	P. R. R. 67	155.6792	Near Conemaugh, Pa.	P. R. R. 24	399.5066
Ryde, Pa.	P. R. R. 68	157.0473	Conemaugh, Pa.	P. R. R. 26	373.9303
Near Ryde, Pa.	P. R. R. 69	162.5396	Woodvale, Pa.	P. R. R. 27	361.2625
Manayunk Bridge, Pa.	P. R. R. 70	164.0847	Johnstown, Pa.	P. R. R. 28	361.9693
Near Vineyard Station, Pa.	P. R. R. 71	171.6220	Do.	P. R. R. 28a	359.7350
Do.	P. R. R. 72	178.1750	Near Sang Hollow, Pa.	P. R. R. 30a	349.8738
Near Newton Hamilton, Pa.	P. R. R. 73	179.8206	Sang Hollow, Pa.	P. R. R. 31	348.8101
Newton Hamilton, Pa.	P. R. R. 74	182.6307	Near Big Spring Run, Pa.	P. R. R. 34	343.3810
Near Mount Union, Pa.	P. R. R. 75	183.3464	Big Spring Run, Pa.	P. R. R. 36	333.5355
Mount Union, Pa.	P. R. R. 76	183.0109	Piney Run, Pa.	P. R. R. 36a	332.7028
Near Mount Union, Pa.	P. R. R. 77	177.5576	Near New Florence, Pa.	P. R. R. 36b	329.3859
Jacktown, Pa.	P. R. R. 78	180.9741	Do.	P. R. R. 37	327.1057
Mapleton, Pa.	P. R. R. 79	181.9675	New Florence, Pa.	P. R. R. 37a	329.2452
Vandevanders Bridge, Pa.	P. R. R. 80	183.1591	Near Lockport, Pa.	P. R. R. 40	317.7507
Bridgeport, Pa.	P. R. R. 81	183.1466	Do.	P. R. R. 41	320.2801
Mill Creek, Pa.	P. R. R. 82	184.8654	Lockport, Pa.	P. R. R. 42	321.5082
Do.	P. R. R. 83	183.2498	Bollivar Junction, Pa.	P. R. R. 43	314.8265
Near Mill Creek, Pa.	P. R. R. 84	183.5909	Do.	P. R. R. 44	315.5824
Ardenheim, Pa.	P. R. R. 85	183.9013	Do.	P. R. R. 44a	315.6982
Near Ardenheim, Pa.	P. R. R. 86	189.2136	Near Bolivar, Pa.	P. R. R. 45	330.7975
Huntingdon, Pa.	P. R. R. 87	190.3076	Pack Saddle, Pa.	P. R. R. 46	336.8809
Do.	P. R. R. 88	190.3472	Do.	P. R. R. 46a	337.4052
Near Warrior Ridge, Pa.	P. R. R. D	203.6538	Blairsville Intersection, Pa.	P. R. R. 47	341.2878
Warrior Ridge, Pa.	P. R. R. 90	205.9060	Near Blairsville, Pa.	P. R. R. 48	339.4655
Near Petersburg, Pa.	P. R. R. 91	205.8814	Millwood, Pa.	P. R. R. 51	355.2623
Petersburg, Pa.	P. R. R. 92	207.4569	Near Millwood, Pa.	P. R. R. 52	350.6112
Near Petersburg, Pa.	P. R. R. 93	211.0290	Derry, Pa.	P. R. R. 53	356.2169
Do.	P. R. R. 94	211.3944	Do.	P. R. R. 54	360.2921
Do.	P. R. R. 95	213.2323	Bradenville, Pa.	P. R. R. 56	331.0110
Near Barree, Pa.	P. R. R. 96	219.5536	Do.	P. R. R. 56a	330.7397
Do.	P. R. R. 97	222.1655	Loyalhanna, Pa.	P. R. R. 57	316.7772
Do.	P. R. R. 98	231.3549	Latrobe, Pa.	P. R. R. 58	307.3748
Do.	P. R. R. 99	231.9340	Do.	P. R. R. 58a	301.3855
Near Union Furnace, Pa.	P. R. R. E	238.5906	Near Latrobe, Pa.	P. R. R. 59	324.2308
Do.	P. R. R. 101	239.6816	Beatty, Pa.	P. R. R. 60	328.3277
Union Furnace, Pa.	P. R. R. 102	243.4579	Carney, Pa.	P. R. R. 61	351.4417
Near Union Furnace, Pa.	P. R. R. 103	250.3248	Near Carney, Pa.	P. R. R. 62	368.6785
Shoenberger, Pa.	P. R. R. 104	255.5061	George, Pa.	P. R. R. 63	305.5517
Near Birmingham, Pa.	P. R. R. 105	261.5015	Greensburg, Pa.	P. R. R. 65	330.9732
Birmingham, Pa.	P. R. R. 106	264.1012	Do.	P. R. R. 66	339.3981
Near Birmingham, Pa.	P. R. R. 107	270.5993	Radebaugh, Pa.	P. R. R. 67	354.1939
Near Tyrone, Pa.	P. R. R. 108	271.4251	Do.	P. R. R. 68	354.9955
Tyrone, Pa.	P. R. R. 109	273.0402	Do.	P. R. R. 68a	352.8192
Do.	P. R. R. 110	277.5543	Do.	P. R. R. 69	349.6371
Near Tyrone, Pa.	P. R. R. 111	281.0105	Do.	P. R. R. 69a	347.7168
Do.	P. R. R. 112	284.7106	Near Grapeville, Pa.	P. R. R. 70	336.2385
Near Grazierville, Pa.	P. R. R. F	287.4111	Grapeville, Pa.	P. R. R. 71	322.9526
Do.	P. R. R. 113	289.7396	Penn., Pa.	P. R. R. 72	296.7468
Tipton, Pa.	P. R. R. 114	302.7297	Near Penn., Pa.	P. R. R. 72a	299.8894
Near Fostoria, Pa.	P. R. R. 115	313.1627	Near Manor, Pa.	P. R. R. 73	288.6974
Bellwood, Pa.	P. R. R. 116	323.7063	Irwin, Pa.	P. R. R. 76a	267.9508
Near Bellwood, Pa.	P. R. R. 117	322.5252	Near Larimer, Pa.	P. R. R. 77a	262.7882
Elizabeth Furnace, Pa.	P. R. R. 118	327.7675	Ardara, Pa.	P. R. R. 78	254.6780
Near Elizabeth Furnace, Pa.	P. R. R. 119	335.2136	Moss Side, Pa.	P. R. R. 81	232.6262
Do.			Wall, Pa.	P. R. R. 82	229.6332
Blair Furnace, Pa.	P. R. R. 120	340.7424	Turtle Creek, Pa.	P. R. R. 84	228.3513
Near Blair Furnace, Pa.	P. R. R. 121	345.2257	Brinton, Pa.	P. R. R. 85	229.2539
Haggerty Run, Pa.	P. R. R. 122	348.1028	Do.	P. R. R. 86	230.6286
Altoona, Pa.	P. R. R. 123	353.9394			
Do.	P. R. R. 124	354.3783			
Do.	P. R. R. 125	356.6125			
Do.	P. R. R. 126	359.9867			
Do.	P. R. R. 127	363.2633			
Kittanning Point, Pa.	P. R. R. 2	495.6550	Near West Penn Jct., Pa.	P. R. R. 27	237.7736
Allegripus, Pa.	P. R. R. 3	589.8983	Near Bagdad, Pa.	P. R. R. 28	236.3500
Bennington, Pa.	P. R. R. 4	618.9303	Do.	P. R. R. 29	239.0888
Allegheny Tunnel, Pa.	P. R. R. 5	648.1023	Near Leechburg, Pa.	P. R. R. 30	237.3555
Gallitzin, Pa.	P. R. R. 6	659.7609	Leechburg, Pa.	P. R. R. 31	240.5047
Cresson, Pa.	P. R. R. 7	616.2162	Near Leechburg, Pa.	P. R. R. 32	237.7528
Near Lilly, Pa.	P. R. R. 8	594.4619	Near Hyde Park, Pa.	P. R. R. 33	242.4630
Lilly, Pa.	P. R. R. 9	575.7164	Near Vandergrift, Pa.	P. R. R. 34	247.2798
Portage, Pa.	P. R. R. 12	514.2491	Vandergrift, Pa.	P. R. R. 35	244.1657
Near Portage, Pa.	P. R. R. 13	494.7994	Near Vandergrift, Pa.	P. R. R. 36	243.2947
Wilmore, Pa.	P. R. R. 14	476.3007	Near Paulton, Pa.	P. R. R. 37	245.7068
Near Wilmore, Pa.	P. R. R. 15	475.1239	Do.	P. R. R. 38	246.7435
Near Ehrenfeld, Pa.	P. R. R. 16	476.2067	Do.	P. R. R. 39	250.0939
Ehrenfeld, Pa.	P. R. R. 17	463.0228	Near Roaring Run, Pa.	P. R. R. 40	251.9446
			Do.	P. R. R. 41	252.3774
			Near Salina, Pa.	P. R. R. 42	254.5066
			Do.	P. R. R. 43	253.0669

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
<i>meters.</i>			<i>meters.</i>		
Near Salina, Pa.	P. R. R. 44.	257.4859	Near Northumberland, Pa.	P. R. R. 6.	137.6715
Do.	P. R. R. 45.	257.2848	Do.	P. R. R. 7.	137.2511
Near Edri, Pa.	P. R. R. 46.	256.3224	Near Kapps, Pa.	P. R. R. 8.	138.5590
Do.	P. R. R. 47.	254.3664	Do.	P. R. R. 9.	139.1570
Do.	P. R. R. 48.	256.4916	Do.	P. R. R. 10.	137.2312
Near Saltsburg, Pa.	P. R. R. 49.	256.2970	Near Montandon, Pa.	P. R. R. 11.	137.5701
Saltsburg, Pa.	P. R. R. 50.	260.7722	Do.	P. R. R. 12.	137.9701
Near White Rock, Pa.	P. R. R. 51.	265.8488	Montandon, Pa.	P. R. R. 13.	139.9155
Near Tunnelton, Pa.	P. R. R. 52.	264.2834	Near Montandon, Pa.	P. R. R. 14.	141.1079
Near Bow, Pa.	P. R. R. 53.	274.7338	Do.	P. R. R. 15.	142.2303
Do.	P. R. R. 54.	275.6026	Near Dougal, Pa.	P. R. R. 16.	142.7214
Near Livermore, Pa.	P. R. R. 55.	281.3063	Milton, Pa.	P. R. R. 17.	145.1817
Do.	P. R. R. 56.	284.5257	Near Milton, Pa.	P. R. R. 18.	144.2737
Near Social Hall, Pa.	P. R. R. 57.	293.3628	Do.	P. R. R. 19.	142.7991
Do.	P. R. R. 58.	293.3875	Near Watsonstown, Pa.	P. R. R. 20.	143.2357
Near Blairsville, Pa.	P. R. R. 59.	304.6059	Do.	P. R. R. 21.	143.6141
Blairsville, Pa.	P. R. R. 60.	308.4254	Watsonstown, Pa.	P. R. R. 22.	148.1500
Near Blairsville, Pa.	P. R. R. 61.	298.4199	Do.	P. R. R. 23.	147.6775
Do.	P. R. R. 62.	294.9399	Near Watsonstown, Pa.	P. R. R. 24.	147.0778
Near Bolivar Junction, Pa.	P. R. R. 63.	305.8958	Near Dewart, Pa.	P. R. R. 25.	147.3041
			Do.	P. R. R. 26.	149.5086
Near Hecks, Pa.	P. R. R. 1.	105.5203	Near Montgomery, Pa.	P. R. R. 27.	148.4519
Hecks, Pa.	P. R. R. 1a.	106.0384	Do.	P. R. R. 28.	149.1901
Near Dauphin, Pa.	P. R. R. 2.	105.6679	Do.	P. R. R. 29.	147.5381
Do.	P. R. R. 3.	106.3756	Montgomery, Pa.	P. R. R. 30.	150.5653
Do.	P. R. R. 4.	105.9312	Do.	P. R. R. 31.	149.8588
Near Geiger Point, Pa.	P. R. R. 5.	106.8979	Near Montgomery, Pa.	P. R. R. 32.	152.8099
Near Clarks Ferry, Pa.	P. R. R. 6.	106.4779	Near Muncy, Pa.	P. R. R. 33.	153.9414
Do.	P. R. R. 7.	107.4021	Do.	P. R. R. 34.	156.1061
Do.	P. R. R. 8.	111.1853	Do.	P. R. R. 35.	156.5517
Do.	P. R. R. 9.	111.4688	Do.	P. R. R. 36.	155.9517
Do.	P. R. R. 10.	113.1696	Do.	P. R. R. 37.	157.2267
Do.	P. R. R. 11.	111.6280	Near Loyalsock, Pa.	P. R. R. 38.	157.6144
Do.	P. R. R. 12.	112.5370	Do.	P. R. R. 39.	158.0416
Near Inglenook, Pa.	P. R. R. 12a.	113.8058	Do.	P. R. R. 40.	157.3534
Near Halifax, Pa.	P. R. R. 13.	113.9560	Do.	P. R. R. 41.	158.0520
Do.	P. R. R. 14.	115.0874	Do.	P. R. R. 42.	158.2079
Do.	P. R. R. 15.	114.7711	Near Williamsport, Pa.	P. R. R. 43.	156.9831
Do.	P. R. R. 16.	115.5393	Do.	P. R. R. 44.	159.3214
Do.	P. R. R. 17.	115.1528	Do.	P. R. R. 45.	160.0445
Do.	P. R. R. 18.	114.6353	Williamsport, Pa.	P. R. R. 45a.	159.2525
Do.	P. R. R. 19.	118.5188	Do.	P. R. R. 46.	160.0790
Near Millersburg, Pa.	P. R. R. 20.	120.2392	Do.	P. R. R. 46a.	161.0084
Do.	P. R. R. 21.	119.1637	Do.	P. R. R. 47.	161.0879
Do.	P. R. R. 22.	120.3804			
Near Liverpool, Pa.	P. R. R. 23.	121.5086	Washington, D. C.	P. R. R. 139A.	3.2417
Liverpool, Pa.	P. R. R. 24.	120.6800	Do.	B. & O. 2.	12.5720
Near Liverpool, Pa.	P. R. R. 25.	121.1959	Eckington, D. C.	B. & O. 3.	29.1037
Do.	P. R. R. 26.	122.4795	Near Brookland, D. C.	B. & O. 3A.	32.7503
Do.	P. R. R. 26a.	122.8946	Brookland, D. C.	B. & O. 4.	39.3659
Mahantongo, Pa.	P. R. R. 27.	122.3979	Near Brookland, D. C.	B. & O. 5.	48.9717
Near Mahantongo, Pa.	P. R. R. 28.	122.5067	Stotts, D. C.	B. & O. 6.	62.3781
Near Georgetown, Pa.	P. R. R. 29.	123.8299	Near Takoma Park, D. C.	B. & O. 7.	81.3588
Do.	P. R. R. 30.	125.8868	Near Silver Spring, Md.	B. & O. 8.	99.8439
Do.	P. R. R. 31.	126.6493	Near Woodside, Md.	B. & O. 9.	98.5634
Do.	P. R. R. 32.	125.1869	Near Linden, Md.	B. & O. 10.	97.5864
Do.	P. R. R. 32a.	126.3851	Near Capitol View, Md.	B. & O. 11.	94.3856
Do.	P. R. R. 33.	126.6932	Kensington, Md.	B. & O. 12.	91.6546
Do.	P. R. R. 34.	127.3979	Near Garrett Park, Md.	B. & O. 13.	87.0279
Near Herndon, Pa.	P. R. R. 35.	127.9930	Near Windham, Md.	B. & O. 14.	96.9925
Do.	P. R. R. 36.	127.9294	Near Halpine, Md.	B. & O. 15.	113.6032
Do.	P. R. R. 36a.	127.8354	Do.	B. & O. 16.	120.0415
Herndon, Pa.	P. R. R. 37.	130.3839	Near Rockville, Md.	B. & O. 17.	128.5297
Near Herndon, Pa.	P. R. R. 38.	129.3848	Near Westmore, Md.	B. & O. 18.	134.8064
Do.	P. R. R. 39.	131.4184	Do.	B. & O. 19.	139.3748
Do.	P. R. R. 40.	131.5166	Derwood, Md.	B. & O. 20.	144.9520
Fishers Ferry, Pa.	P. R. R. 41.	131.5172	Near Washington Grove, Md.	B. & O. 21.	151.5335
Near Sellinsgrove Jct., Pa.	P. R. R. 42.	133.1089	Do.	B. & O. 22.	158.1377
Do.	P. R. R. 43.	133.2678	Near Gaithersburg, Md.	B. & O. 23.	149.5558
Sellinsgrove Junction, Pa.	P. R. R. 44.	132.0793	Near Ward, Md.	B. & O. 24.	136.0205
Near Sellinsgrove Jct., Pa.	P. R. R. 45.	132.9456	Do.	B. & O. 25.	123.2528
Do.	P. R. R. 46.	134.4398	Near Clopper, Md.	B. & O. 26.	111.0737
Near Sunbury, Pa.	P. R. R. 47.	134.6872	Waring, Md.	B. & O. 27.	121.8891
Do.	P. R. R. 48.	134.2336	Near Germantown, Md.	B. & O. 28.	134.7624
Sunbury, Pa.	P. R. R. 49.	134.4965	Do.	B. & O. 29.	128.8010
Do.	P. R. R. 50.	135.5450	Near Darby, Md.	B. & O. 30.	127.1219
Near Sunbury, Pa.	P. R. R. 1.	135.4752	Near Boyd, Md.	B. & O. 31.	131.6289
Do.	P. R. R. 2.	135.4694	Near Buck Lodge, Md.	B. & O. 32.	134.6029
Near Northumberland, Pa.	P. R. R. 3.	137.7374	Do.	B. & O. 33.	150.8546
Do.	P. R. R. 4.	137.5670	Near Barnesville, Md.	B. & O. 34.	156.1251
Do.	P. R. R. 5.	138.2441	Do.	B. & O. 34.	

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Barnesville, Md.	B. & O. 35	138.0219	Near Orleans Road, W. Va.	B. & O. 113	148.0974
Near Dickerson, Md.	B. & O. 36	120.9902	Do.	B. & O. 114	153.7035
Do.	B. & O. 37	104.9482	Near Rockwells Run, W. Va.	B. & O. 115	159.4115
Do.	B. & O. 38	86.6998			
Near Tuscarora, Md.	B. & O. 39	77.6776	Doe Gully, W. Va.	B. & O. 116	166.6196
Do.	B. & O. 40A	68.9129	Near Doe Gully, W. Va.	B. & O. 117	165.8299
Do.	B. & O. 41	69.1122	Near Hansrotte, W. Va.	B. & O. 118	158.6379
Do.	B. & O. 42	69.1371	Do.	B. & O. 119	150.6382
Near Washington Jct., Md.	B. & O. 43	71.3565	Do.	B. & O. 120	151.7557
Point of Rocks, Md.	B. & O. 44A	71.0660	Near Baird, W. Va.	B. & O. 121	151.6820
Near Catoclin, Md.	B. & O. 45	72.6214	Do.	B. & O. 122	149.3199
Catoclin, Md.	B. & O. 46	72.8882	Near Magnolia, W. Va.	B. & O. 123	160.5939
Near Catoclin, Md.	B. & O. 47	73.9577	Do.	B. & O. 124	151.6783
Do.	B. & O. 48	74.8962	Do.	B. & O. 125	153.0327
Near Brunswick, Md.	B. & O. 49	75.4518	Do.	B. & O. 126	155.9118
Do.	B. & O. 50	75.5032	Near Paw Paw, W. Va.	B. & O. 127	167.3456
Do.	B. & O. 51	76.3300	Do.	B. & O. 128	160.5240
Near Knoxville, Md.	B. & O. 52	79.1049	Do.	B. & O. 129	162.7845
Knoxville, Md.	B. & O. 53	78.6517	Do.	B. & O. 130	162.1755
Near Weverton, Md.	B. & O. 54	78.6647	Near Little Cacapon, W. Va.	B. & O. 131	161.1943
Do.	B. & O. 55	80.2609	Do.	B. & O. 132	160.9515
Do.	B. & O. 56	85.4257	Near Okonoko, W. Va.	B. & O. 133	162.9034
Harpers Ferry, W. Va.	B. & O. 56A	86.9999	Do.	B. & O. 134	164.0951
Near Harpers Ferry, W. Va.	B. & O. 57	88.6414	Do.	B. & O. 135	163.7032
Near Engle, W. Va.	B. & O. 58	94.4700	Near French, W. Va.	B. & O. 136	164.8323
Do.	B. & O. 59	106.1266	Do.	B. & O. 137	168.8610
Do.	B. & O. 60	117.8179	Do.	B. & O. 138	169.5365
Near Duffields, W. Va.	B. & O. 61	125.3425	Near Green Spring, W. Va.	B. & O. 139	168.2501
Duffields, W. Va.	B. & O. 62	134.3853	Do.	B. & O. 140	170.4557
Near Shenandoah Jct., W. Va.	B. & O. 63	147.6056	Do.	B. & O. 141	171.3208
Do.	B. & O. 64	161.7380	Do.	B. & O. 142	170.5895
Near Hobbs, W. Va.	B. & O. 65	170.7871	Near Dans Run, W. Va.	B. & O. 143	172.1673
Near Kerneville, W. Va.	B. & O. 66	177.8818	Do.	B. & O. 144	172.4802
Do.	B. & O. 67	172.0345	Near Patterson Creek Cut-Off, W. Va.	B. & O. 145	172.9909
Near Van Clevesville, W. Va.	B. & O. 68	101.0443			
Do.	B. & O. 69	151.6516	Patterson Creek Cut-Off, W. Va.	B. & O. 145A	173.4118
Do.	B. & O. 70	145.7209	Do.	574 Patterson Creek	174.8961
Do.	B. & O. 71	137.3428	Near Patterson Creek, W. Va.	B. & O. 146	175.3101
Do.	B. & O. 72	123.1192			
Near Opequon, W. Va.	B. & O. 73	117.0616	Near North Branch, Md.	B. & O. 147	182.3645
Near Martinsburg, W. Va.	B. & O. 74	121.7172	North Branch, Md.	B. & O. 147A	183.0468
Do.	B. & O. 75	131.9615	Near North Branch, Md.	B. & O. 148	190.5535
Do.	B. & O. 76	143.1528	Do.	B. & O. 149	194.1751
Do.	B. & O. 77	149.4313	Near Evitts Creek, Md.	B. & O. 150	191.8504
Near Tabb, W. Va.	B. & O. 78	160.6543	Do.	B. & O. 151	194.5954
Do.	B. & O. 79	159.3002	Near Cumberland, Md.	B. & O. 152	197.5502
Do.	B. & O. 80	157.9176	Cumberland, Md.	B. & O. 153	192.8172
Near N. Mountain, W. Va.	B. & O. 81	154.5149	Do.	B. & O. 153A	195.0005
Do.	B. & O. 82	160.9031	Do.	B. & O. 154	196.3948
Do.	B. & O. 83	161.0784	Near Cumberland, Md.	B. & O. 155	199.1660
Do.	B. & O. 84	153.6552	Do.	B. & O. 156	200.0098
Near Back Creek, W. Va.	B. & O. 85	140.7663	Near Mount Savage Junction, Md.	B. & O. 157	207.7119
Do.	B. & O. 86	129.9671			
Near Cherry Run, W. Va.	B. & O. 87	119.3712	Mount Savage Jct., Md.	B. & O. 158	210.5426
Do.	B. & O. 88	117.2980	Ellerslie, Md.	B. & O. 160A	221.8859
Do.	B. & O. 89	120.8730	Near Ellerslie, Md.	B. & O. 160B	225.9770
Near Miller, W. Va.	B. & O. 90	123.2425	Near Cooks Mills, Pa.	B. & O. 161A	228.3729
Do.	B. & O. 91	120.7934	Do.	B. & O. 163A	237.5520
Near Sleepy Creek, W. Va.	B. & O. 92	121.6723	Do.	B. & O. 165A	250.4074
Sleepy Creek, W. Va.	B. & O. 92A	120.5669	Near Hyndman, Pa.	B. & O. 167A	275.4709
Near Sleepy Creek, W. Va.	B. & O. 93	122.3014	Do.	P. R. R. 5	288.1234
Do.	B. & O. 94	123.6826	Do.	B. & O. 168A	291.9832
Do.	B. & O. 95	124.0377	Near Hoblitzell, Pa.	B. & O. 170	333.6437
Near Hancock, W. Va.	B. & O. 96	123.4619	Do.	B. & O. 171	359.6117
Do.	B. & O. 97	124.6978	Williams, Pa.	B. & O. 172	382.1979
Hancock, W. Va.	B. & O. 97A	127.2199	Near Fairhope, Pa.	B. & O. 173	405.4195
Near Hancock, W. Va.	B. & O. 98	127.6340	Do.	B. & O. 174	427.1504
Do.	B. & O. 99	127.1678	Do.	B. & O. 174A	440.0471
Near Round Top, W. Va.	B. & O. 100	126.6758	Near Foley, Pa.	B. & O. 175	457.0377
Round Top, W. Va.	B. & O. 101	130.0371	Foley, Pa.	B. & O. 176	465.1512
Near Round Top, W. Va.	B. & O. 102	129.9577			
Near Sir Johns Run, W. Va.	B. & O. 103	129.5232			
Do.	B. & O. 104	130.0583	Near Valley Falls, W. Va.	986 Pittsburg	300.2432
Do.	B. & O. 105	130.0279	Near Powells, W. Va.	899 Pittsburg	273.8611
Near Great Cacapon, W. Va.	B. & O. 106	132.9952	Bentons Ferry, W. Va.	885 Pittsburg	209.6102
Do.	B. & O. 107	132.7752	Near Fairmont, W. Va.	885 Pittsburg	209.5995
Do.	B. & O. 108	134.0983	Near Catawba, W. Va.	873 Pittsburg	265.8178
Near Woodmont, W. Va.	B. & O. 109	137.2363	Near Little Falls, W. Va.	859 Pittsburg	261.6362
Near Lineburg, W. Va.	B. & O. 110	138.4314	Uffington, W. Va.	828 Pittsburg	252.2080
Do.	B. & O. 111	139.6636	Morgantown, W. Va.	821 Pittsburg	250.0751
Do.	B. & O. 112	142.8692	Do.	U. S. E.	250.0724

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Van Vorhis, W. Va.	815 Pittsburg	248.3588	Near Ringgold, Tex.	897 GAINV.	273.3273
Near Point Marion, Pa.	813 Pittsburg	247.6586	Ringgold, Tex.	894 GAINV.	272.6897
Near Outcrop, Pa.	1084 Pittsburg	330.2535	Near Terral, Okla.	G	248.6684
Fairchance, Pa.	1065 Pittsburg	324.5756	Do.	809 Terral	246.7218
Uniontown, Pa.	999 Pittsburg	304.3606	Terral, Okla.	A	258.1993
Near Upper Middletown, Pa.	920 Pittsburg	280.2487	Near Terral, Okla.	B	253.3876
Near Tippecanoe, Pa.	868 Pittsburg	264.3352	Near Ryan, Okla.	827 Ryan	252.3183
Near West Brownsville Junction, Pa.	778 Pittsburg	236.9454	Do.	C	252.1583
Do.	P. R. R. 54	236.9439	Near Sugden, Okla.	Geol. Sugden	257.4809
Near Woods Run, Pa.	764 Pittsburg	233.1918	Do.	844 Sugden	257.4475
Near Charleroi, Pa.	760 Pittsburg	230.9128	Sugden, Okla.	D	258.5002
Lock No. 4, Pa.	Lock No. 4	226.6259	Near Sugden, Okla.	875 Boundary	266.7566
Balrd, Pa.	755 Pittsburg	230.0754	Near Addington, Okla.	883 Addington	269.4103
Near River View, Pa.	753 Pittsburg	229.5113	Do.	E	277.4500
Near Peters Creek, Pa.	740 Pittsburg	225.3679	Addington, Okla.	918 Addington	279.8841
Near Coal Valley, Pa.	P. R. R. 19	224.4121	Near Addington, Okla.	F	283.7088
Near Thomson, Pa.	767 Pittsburg	233.7413	Near Comanche, Okla.	G	295.0950
Do.	P. R. R. 11	232.8205	Comanche, Okla.	H	300.8832
Near Bessemer, Pa.	760 Pittsburg	231.4914	Near Comanche, Okla.	I	309.9464
Braddock, Pa.	P. R. R. 88	252.5996	Near Duncan, Okla.	1104 Boundary	336.6213
Homewood, Pa.	P. R. R. 92	281.4429	Do.	Duncan A	373.2886
Near Benvenue, Pa.	818 Pittsburg	249.3831	Do.	Check B. M.	373.2615
			Duncan, Okla.	J	343.4396
Solomon, Kans.	C	358.6146	Near Duncan, Okla.	1127 Duncan	343.8010
New Cambria, Kans.	D	365.9656	Near Marlow, Okla.	K	395.7455
Near New Cambria, Kans.	E	365.6214	Marlow, Okla.	L	400.5624
Do.	Salina East Base	366.0132	Do.	Marlow Long Sta.	400.1304
Near Salina, Kans.	Salina West Base	372.1066	Near Marlow, Okla.	1331 Marlow	406.0918
Salina, Kans.	F	373.4775	Do.	M	386.8856
Do.	G	373.8903	Rush Springs, Okla.	N	393.9381
Do.	H	373.9241	Do.	1349 Rush Springs	411.5540
Mentor, Kans.	A	385.9506	Near Rush Springs, Okla.	1292 Rush Springs	394.0581
Assaria, Kans.	B	391.0303	Near Ninnekah, Okla.	T. B. M. 95	383.6235
Bridgeport, Kans.	C	396.9333	Do.	O	373.4963
Lindsborg, Kans.	D	407.4889	Do.	P	328.2014
Johnstown, Kans.	E	424.5708	Near Chickasha, Okla.	1084 Chickasha	330.7602
Hilton, Kans.	F	463.0695	Chickasha, Okla.	1091 Chickasha	332.8541
McPherson, Kans.	G	466.1513	Do.	Q	333.1727
Do.	H	466.4891	Near Chickasha, Okla.	R	332.3524
Near McPherson, Kans.	I	464.1507	Do.	1105 Boundary	337.0766
Groveland, Kans.	J	461.9881	Do.	S	332.0051
Inman, Kans.	K	463.0913	Near Minco, Okla.	T. B. M. 114	335.8112
Medora, Kans.	L	460.4266	Do.	Carson A	435.8140
Near Hutchinson, Kans.	M	467.9280	Minco, Okla.	1284 Minco	391.7412
Hutchinson, Kans.	N	467.3002	Do.	T	395.4453
Do.	O	466.3585	Near Union, Okla.	U	396.6180
Fernie, Kans.	P	472.0441	Union, Okla.	1206.5 Union	386.5362
Darlow, Kans.	Q	474.7072	Near Elreno, Okla.	A	406.9897
Castleton, Kans.	R	447.0577	Do.	Elreno East Base	440.1664
Pretty Prairie, Kans.	S	480.2185	Elreno, Okla.	Elreno West Base	466.9034
Near Pretty Prairie, Kans.	T	481.3153	Do.	T. B. M. 142	416.2977
Varner, Kans.	U	463.4737	Do.	B	414.7077
Lashmet, Kans.	V	461.0761	Do.	1357 Elreno	414.3283
Kingman, Kans.	W	460.4902	Do.	City Elreno	413.9153
Near Kingman, Kans.	X	505.2364	Reno Junction, Okla.	1327 Reno Junct.	405.1837
Carvel, Kans.	Y	496.5679	Darlington, Okla.	C	407.4694
Basil, Kans.	Z	487.5501	Near Caddo, Okla.	T. B. M. 148	416.5319
Rago, Kans.	A	441.1612	Okarche, Okla.	D	377.8649
Duquoin, Kans.	B	482.9938	Kingfisher, Okla.	E	321.0963
Harper, Kans.	C	433.5102	Do.	F	322.4203
Ascot, Kans.	D	432.9180	Do.	G	322.1219
Near Anthony, Kans.	E	422.3674	Dover, Okla.	H	315.2727
Do.	Anthony SE. Base	419.7217	Hennessey, Okla.	I	354.3790
Anthony, Kans.	Anthony NW. Base	425.4252	Do.	J	354.5015
	F	409.8891	Bison, Okla.	K	378.1473
			Waukomis, Okla.	L	385.4696
			Near Waukomis, Okla.	Waukomis A	388.8696
			Do.	Waukomis E	384.7530
			Enid, Okla.	M	377.3222
			Do.	N	380.2924
Bowie, Tex.	1124 GAINV.	342.6371	North Enid, Okla.	O	381.1307
Do.	A	329.3393	Near North Enid, Okla.	Enid A	385.2267
Do.	B	349.1321	Kremlin, Okla.	P	341.8220
Near Bowie, Tex.	C	289.8555	Pond Creek, Okla.	Q	320.3173
Near Bellevue, Tex.	Bowie Northwest Base	327.4599	Near Jefferson, Okla.	R	319.5612
Do.	Bowie Southeast Base	333.3981	Medford, Okla.	S	331.5632
Near Bowie, Tex.	999 GAINV.	301.6391	Do.	T	335.2350
Do.	D	292.6512	Do.	U	335.1895
Stoneburg, Tex.	E	285.1135	Clyde, Okla.	V	339.4849
Do.	936 GAINV.	285.4463	Wakita, Okla.	W	360.4303
Near Stoneburg, Tex.	876 GAINV.	267.0987	Gibbon, Okla.	X	300.7652
Near Ringgold, Tex.	F	268.8798	Manchester, Okla.	Y	382.9126

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Spring, Kans.	G <sub>0</sub>	417.0139	Guida Rock, Nebr.	D.	507.5938
Fort Worth, Tex.	V.	188.8083	Amboy, Nebr.	E.	515.6155
Handley, Tex.	W.	176.3524	Cowles, Nebr.	F.	546.6524
Arlington, Tex.	X.	188.4038	Near Blue Hill, Nebr.	G.	594.1388
Grand Prairie, Tex.	Y.	159.9940	Do.	Blue Hill Δ	622.2757
Eagle Ford, Tex.	Z.	134.4461	Blue Hill, Nebr.	H.	601.1423
Dallas, Tex.	A <sub>1</sub>	132.3271	Ayr, Nebr.	I.	560.3007
Do.	B <sub>1</sub>	134.4555	Brickton, Nebr.	J.	557.9891
Do.	C <sub>1</sub>	132.8139	Hastings, Nebr.	K.	588.7497
Fisher, Tex.	D <sub>1</sub>	161.1482	Do.	Bank.	588.8560
Garland, Tex.	E <sub>1</sub>	107.9740	Hansen, Nebr.	Tower.	589.1993
Rowlett, Tex.	F <sub>1</sub>	153.9217	Doniphan, Nebr.	L.	592.2326
Rockwall, Tex.	G <sub>1</sub>	181.5846	Rivers, Nebr.	M.	593.0083
Fate, Tex.	H <sub>1</sub>	180.1112	Near Grand Island, Nebr.	N.	571.2795
Royse, Tex.	I <sub>1</sub>	170.8958	Grand Island, Nebr.	O.	572.4071
Caddo Mills, Tex.	J <sub>1</sub>	161.7301	Do.	P.	568.4370
Greenville, Tex.	K <sub>1</sub>	164.9212	Near Grand Island, Nebr.	Q.	565.9666
Do.	L <sub>1</sub>	168.9728	Near Aida, Nebr.	R.	579.7684
Do.	M <sub>1</sub>	167.1879	Wood River, Nebr.	S.	591.0925
Near Greenville, Tex.	N <sub>1</sub>	173.3170	Shelton, Nebr.	Shelton East Base.	599.3533
Campbell, Tex.	O <sub>1</sub>	178.5741	Lockwood, Nebr.	U.	615.8885
Cumby, Tex.	P <sub>1</sub>	197.8910	Chapman, Nebr.	V.	550.0462
Brashear, Tex.	Q <sub>1</sub>	157.0144	Paddock, Nebr.	W.	539.9039
Sulphur Springs, Tex.	R <sub>1</sub>	158.5409	Central City, Nebr.	X.	525.0058
Como, Tex.	S <sub>1</sub>	162.2995	Thummel, Nebr.	Y.	518.9306
Pickton, Tex.	T <sub>1</sub>	163.6719	Clarks, Nebr.	Z.	505.7404
Winnboro, Tex.	U <sub>1</sub>	162.6062	Havens, Nebr.	A <sub>1</sub>	495.7733
Scroggins, Tex.	V <sub>1</sub>	108.4911	Silver Creek, Nebr.	B <sub>1</sub>	483.1679
Near Leesburg, Tex.	W <sub>1</sub>	119.1629	Duncan, Nebr.	C <sub>1</sub>	471.9332
Near Pittsburg, Tex.	X <sub>1</sub>	117.8482	Near Columbus, Nebr.	Columbus 2.	455.1574
Pittsburg, Tex.	Y <sub>1</sub>	121.3055	Do.	Columbus 3.	443.4115
Cason, Tex.	Z <sub>1</sub>	99.4019	Columbus, Nebr.	D <sub>1</sub>	440.0454
Dalingerfield, Tex.	A <sub>2</sub>	122.7894	Do.	E <sub>1</sub>	441.1722
Hughes, Tex.	B <sub>2</sub>	115.2949	Near Columbus, Nebr.	F <sub>1</sub>	441.6094
Avinger, Tex.	C <sub>2</sub>	120.4749	Oconee, Nebr.	G <sub>1</sub>	446.3215
Near Avinger, Tex.	D <sub>2</sub>	121.8087	Platte Center, Nebr.	H <sub>1</sub>	455.3181
Lasater, Tex.	E <sub>2</sub>	102.0099	Tarnov, Nebr.	I <sub>1</sub>	468.8985
Kellyville, Tex.	F <sub>2</sub>	89.4466	Humphrey, Nebr.	J <sub>1</sub>	495.4228
Jefferson, Tex.	G <sub>2</sub>	57.7561	Near Madison, Nebr.	K <sub>1</sub>	518.3051
Norwood, Tex.	I <sub>2</sub>	63.1077	Madison, Nebr.	L <sub>1</sub>	495.0191
Karnack, Tex.	J <sub>2</sub>	70.4936	Near Madison, Nebr.	M <sub>1</sub>	484.9522
Blocker, Tex.	K <sub>2</sub>	80.7373	Near Norfolk, Nebr.	N <sub>1</sub>	517.5394
Waskom, Tex.	L <sub>2</sub>	91.2165	Norfolk, Nebr.	O <sub>1</sub>	464.1507
Greenwood, La.	C.	66.9517	Do.	P <sub>1</sub>	465.3072
Nichols, La.	D.	83.9829	Near Norfolk, Nebr.	Norfolk 3.	464.5430
Jewella, La.	E.	74.4669			462.2147
Shreveport, La.	F.	57.6165	Hope, Nebr.	Q <sub>1</sub>	473.8317
Do.	G.	62.2690	Hoskins, Nebr.	R <sub>1</sub>	508.3238
Do.	H.	55.4205	Apex, Nebr.	S <sub>1</sub>	544.2871
Do.	I.	55.9910	Winside, Nebr.	T <sub>1</sub>	476.9221
			Wayne, Nebr.	U <sub>1</sub>	444.8849
Solomon, Kans.	W <sub>1</sub>	356.1768	Wakefield, Nebr.	V <sub>1</sub>	431.1388
Do.	X <sub>1</sub>	* 357.5738	Ridge, Nebr.	W <sub>1</sub>	463.0907
Abilene, Kans.	B <sub>1</sub>	352.9868	Emerson, Nebr.	X <sub>1</sub>	434.7679
Do.	Z <sub>1</sub>	353.0274	Nacora, Nebr.	Y <sub>1</sub>	429.3145
Do.	Y <sub>1</sub>	350.7139	Hubbard, Nebr.	Z <sub>1</sub>	352.7596
Talmage, Kans.	A <sub>2</sub>	369.4418	Coburn, Nebr.	A <sub>2</sub>	336.5795
Manchester, Kans.	B <sub>2</sub>	394.8811	Dakota City, Nebr.	M. R. C. Dakota City.	334.8850
Longford, Kans.	C <sub>2</sub>	400.9809	South Sioux City, Nebr.	B <sub>2</sub>	336.2544
Oak Hill, Kans.	D <sub>2</sub>	387.0822	Sioux City, Iowa.	P. B. M. 395 Gauge B. M.	333.8711
Cattlin, Kans.	E <sub>2</sub>	404.9961	Do.	P. B. M. 396-145	337.5707
Miltonvale, Kans.	F <sub>2</sub>	419.7490	Do.	Top of cap.	338.7957
Sulphur Springs, Kans.	G <sub>2</sub>	479.8498	Near Sioux City, Iowa.	P. B. M. 397.	335.7624
Aurora, Kans.	H <sub>2</sub>	451.8464	Do.	Top of cap.	336.9861
Huscher, Kans.	I <sub>2</sub>	446.9987			
Concordia, Kans.	J <sub>2</sub>	422.6309	Hadar, Nebr.	C <sub>2</sub>	474.7710
Do.	City.	419.5589	Pierce, Nebr.	D <sub>2</sub>	485.4146
Do.	K <sub>2</sub>	417.1459	Foster, Nebr.	E <sub>2</sub>	499.8048
Hannum, Kans.	L <sub>2</sub>	415.7207	Plainview, Nebr.	F <sub>2</sub>	517.7330
Oneonta, Kans.	M <sub>2</sub>	426.0519	Do.	G <sub>2</sub>	517.7501
Kackley, Kans.	N <sub>2</sub>	461.6196	Brunswick, Nebr.	H <sub>2</sub>	565.4936
Courtland, Kans.	O <sub>2</sub>	457.6689	Savage, Nebr.	I <sub>2</sub>	569.7210
Lovewell, Kans.	P <sub>2</sub>	471.2386	Orchard, Nebr.	J <sub>2</sub>	592.0634
Webber, Kans.	Q <sub>2</sub>	508.5963	Page, Nebr.	K <sub>2</sub>	596.6361
Near Superior, Nebr.	R <sub>2</sub>	472.8009	Near Page, Nebr.	L <sub>2</sub>	611.5441
Superior, Nebr.	B.	479.9071	Do.	M <sub>2</sub>	625.9661
Near Superior, Nebr.	Superior 2.	476.7252	Do.	Page SW. Base.	626.4913
Bostwick, Nebr.	C.	499.0741			

\* Reported destroyed, 1900.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		meters.			meters.
Near O'Neill, Nebr.	N <sub>1</sub>	595.9211	Near Glendo, Wyo.	F <sub>1</sub>	1432.3796
O'Neill, Nebr.	O <sub>1</sub>	606.0506	Near Bona, Wyo.	Q <sub>1</sub>	1433.5251
Do.	P <sub>1</sub>	610.0172	Near Orin Junction, Wyo.	R <sub>1</sub>	1424.9993
Emmet, Nebr.	Q <sub>1</sub>	616.6423	Orin Junction, Wyo.	S <sub>1</sub>	1434.6192
Near Atkinson, Nebr.	R <sub>1</sub>	630.0352	Near Orin Junction, Wyo.	T <sub>1</sub>	1430.3544
Atkinson, Nebr.	S <sub>1</sub>	643.3666			
Near Stuart, Nebr.	T <sub>1</sub>	652.5852	Near Denver, Colo.	N <sub>1</sub>	1564.8923
Stuart, Nebr.	U <sub>1</sub>	657.4502	Near Hazeltine, Colo.	O <sub>1</sub>	1552.5274
Newport, Nebr.	V <sub>1</sub>	680.3791	Near Henderson, Colo.	P <sub>1</sub>	1535.1436
Near Bassett, Nebr.	W <sub>1</sub>	693.7752	Near Brighton, Colo.	Q <sub>1</sub>	1526.5914
Bassett, Nebr.	X <sub>1</sub>	709.5096	Brighton, Colo.	R <sub>1</sub>	1514.3725
Long Pine, Nebr.	Y <sub>1</sub>	732.7376	Near Lupton, Colo.	S <sub>1</sub>	1505.2301
Ainsworth, Nebr.	Z <sub>1</sub>	769.4536	Lupton, Colo.	T <sub>1</sub>	1495.4691
Near Johnstown, Nebr.	A <sub>1</sub>	789.6029	Near Lupton, Colo.	U <sub>1</sub>	1484.7855
Near Woodlake, Nebr.	B <sub>1</sub>	810.2186	Near Plattville, Colo.	V <sub>1</sub>	1475.0141
Do.	C <sub>1</sub>	823.9556	Do.	W <sub>1</sub>	1469.5315
Near Arabia, Nebr.	D <sub>1</sub>	831.6537	Do.	X <sub>1</sub>	1462.2116
Tratcher, Nebr.	E <sub>1</sub>	849.3548	Near Nantes, Colo.	Y <sub>1</sub>	1440.5864
Valentine, Nebr.	F <sub>1</sub>	788.4292	Near La Salle, Colo.	Z <sub>1</sub>	1418.0280
Near Crookston, Nebr.	G <sub>1</sub>	796.3103	Greeley, Colo.	A <sub>1</sub>	1418.3236
Do.	H <sub>1</sub>	830.2640	Lucerne, Colo.	B <sub>1</sub>	1447.0719
Georgia, Nebr.	I <sub>1</sub>	888.9934	Eaton, Colo.	C <sub>1</sub>	1473.2823
Nenzli, Nebr.	J <sub>1</sub>	948.4614	Pierce, Colo.	D <sub>1</sub>	1534.8373
Cody, Nebr.	K <sub>1</sub>	944.9569	Dover, Colo.	E <sub>1</sub>	1648.4560
Near Cody, Nebr.	L <sub>1</sub>	956.5103	Carr, Colo.	F <sub>1</sub>	1738.6584
Near Eli, Nebr.	M <sub>1</sub>	981.5427	Athol, Wyo.	A	1920.9996
Do.	N <sub>1</sub>	973.6969	Cheyenne, Wyo.	B	1847.5070
Near Merriman, Nebr.	O <sub>1</sub>	988.8892	Do.	C	1847.3180
Do.	P <sub>1</sub>	1015.9328	Do.	D	1847.2802
Irwin, Nebr.	Q <sub>1</sub>	1048.5110	Do.	E	1858.8924
Near Gordon, Nebr.	R <sub>1</sub>	1080.9043	Borie, Wyo.	F	2014.2198
Gordon, Nebr.	S <sub>1</sub>	1083.7325	Otto, Wyo.	G	2119.8778
Do.	T <sub>1</sub>	1084.4992	Granite Canyon, Wyo.	H	2229.3731
Near Clinton, Nebr.	U <sub>1</sub>	1129.7212	Sherman, Wyo.	I	2515.0216
Rushville, Nebr.	V <sub>1</sub>	1140.2482	Do.	J	2524.6265
Near Rushville, Nebr.	W <sub>1</sub>	1145.4956	Dale Creek, Wyo.	K	2459.7317
Hay Springs, Nebr.	X <sub>1</sub>	1167.3228	Do.	L	2438.8207
Near Bordeaux, Nebr.	Y <sub>1</sub>	1137.8678	Red Buttes, Wyo.	M	2225.7109
Near Chadron, Nebr.	Z <sub>1</sub>	1033.6023	Laramie, Wyo.	N	2183.7500
Chadron, Nebr.	A <sub>1</sub>	1027.4385	Do.	O	2173.5244
Do.	B <sub>1</sub>	1034.3670	Howell, Wyo.	P	2164.7021
Near Chadron, Nebr.	C <sub>1</sub>	1017.6407	Wyoming, Wyo.	Q	2157.2615
Do.	D <sub>1</sub>	1006.0891	Coopers Lake, Wyo.	R	2146.6845
Whitney, Nebr.	E <sub>1</sub>	1039.6800	Lookout, Wyo.	S	2185.8650
Near Crawford, Nebr.	F <sub>1</sub>	1096.2678	Harper, Wyo.	T	2136.1527
Crawford, Nebr.	G <sub>1</sub>	1121.5068	Near Rock Creek, Wyo.	U	2043.2635
Fort Robinson, Nebr.	H <sub>1</sub>	1153.8549	Rock Creek, Wyo.	V	2043.0711
Near Glen, Nebr.	I <sub>1</sub>	1221.5706			
Near Andrews, Nebr.	J <sub>1</sub>	1346.6713	Rock Creek, Wyo.	W	*2043.1305
Near Harrison, Nebr.	K <sub>1</sub>	1482.9046	Near Wilcox, Wyo.	C <sub>1</sub>	2109.8418
Harrison, Nebr.	L <sub>1</sub>	1487.3138	Near Aurora, Wyo.	D <sub>1</sub>	2055.6176
Near Harrison, Nebr.	M <sub>1</sub>	1463.6455	Medicine Bow, Wyo.	E <sub>1</sub>	2000.7227
Near Van Tassel, Nebr.	U <sub>1</sub>	1452.7900	Do.	F <sub>1</sub>	1999.1204
Noble Ranch, Wyo.	V <sub>1</sub>	1505.1590	Allen, Wyo.	G <sub>1</sub>	2015.3001
Lusk, Wyo.	W <sub>1</sub>	1529.0555	Near Como, Wyo.	H <sub>1</sub>	2062.7276
Manville, Wyo.	X <sub>1</sub>	1599.3044	Hanna, Wyo.	I <sub>1</sub>	2065.8254
Keele, Wyo.	Y <sub>1</sub>	1612.3700	Near Hanna, Wyo.	J <sub>1</sub>	2064.8506
Lost Spring, Wyo.	Z <sub>1</sub>	1522.8945	Dana, Wyo.	K <sub>1</sub>	2069.7279
Shawnee, Wyo.	A <sub>1</sub>	1531.8979	Edson, Wyo.	L <sub>1</sub>	2061.0847
Fisher, Wyo.	B <sub>1</sub>	1451.5631	Near Walcott, Wyo.	M <sub>1</sub>	2012.6746
			Fort Steele, Wyo.	N <sub>1</sub>	1985.0916
Near Silver Crown, Wyo.	X	1915.9010	Near Greenville, Wyo.	Geol. Surv. West Base	2006.1031
Silver Crown, Wyo.	Y	1951.7370	Do.	O <sub>1</sub>	2006.4820
Near Volente, Wyo.	Z	2057.6940	Rawlins, Wyo.	P <sub>1</sub>	2056.4014
Islay, Wyo.	A <sub>1</sub>	2044.1201	Do.	Q <sub>1</sub>	2058.2392
Near Horse Creek, Wyo.	B <sub>1</sub>	1985.6754	Do.	R <sub>1</sub>	2068.2570
Near Iron Mountain, Wyo.	C <sub>1</sub>	1984.2643	Solon, Wyo.	S <sub>1</sub>	2110.0501
Do.	D <sub>1</sub>	1872.3540	Near Daleys Ranch, Wyo.	T <sub>1</sub>	2035.0695
Near Diamond, Wyo.	E <sub>1</sub>	1764.2278	Riner, Wyo.	U <sub>1</sub>	2059.0478
Do.	F <sub>1</sub>	1668.5494	Fillmore, Wyo.	V <sub>1</sub>	2126.2603
Near Chugwater, Wyo.	G <sub>1</sub>	1586.0852	Creston, Wyo.	W <sub>1</sub>	2166.5822
Near Bordeaux, Wyo.	H <sub>1</sub>	1508.4344	Near Latham, Wyo.	X <sub>1</sub>	2111.3042
Near Wheatland, Wyo.	I <sub>1</sub>	1440.2616	Wamsutter, Wyo.	Y <sub>1</sub>	2044.3634
Wheatland, Wyo.	4737 CHYN	1443.1510	Near Red Desert, Wyo.	A <sub>1</sub>	2048.7670
Do.	J <sub>1</sub>	1444.9904	Red Desert, Wyo.	B <sub>1</sub>	2047.5344
Uva, Wyo.	K <sub>1</sub>	1362.4195			
Near Buckhorn, Wyo.	L <sub>1</sub>	1446.0373	Near Red Desert, Wyo.	Z <sub>1</sub>	2050.7664
Hartville Junction, Wyo.	M <sub>1</sub>	1393.8754	Tipton, Wyo.	C <sub>1</sub>	2132.3999
Wendover, Wyo.	N <sub>1</sub>	1355.2990			
Cassa, Wyo.	O <sub>1</sub>	1368.2253			

\* Elevation from line of 1902 only. The bench mark had apparently settled about 5mm since determination in 1899.

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Table Rock, Wyo.	D <sub>3</sub>	2087.6606	Garner, Idaho	C	1447.5105
Near Monell, Wyo.	U. P. 779	2056.9845	Do.	D	1446.0440
Monell, Wyo.	E <sub>3</sub>	2056.4047	Near Oxford, Idaho	E	1446.0415
Bittercreek, Wyo.	F <sub>3</sub>	2040.3546	Near Swan Lake, Idaho	F	1455.4461
Near Black Buttes, Wyo.	G <sub>3</sub>	2020.2350	Downey, Idaho	G	1480.0676
Black Buttes, Wyo.	U. P. 793	2016.5424	Marsh Valley, Idaho	H	1445.5175
Hallville, Wyo.	H <sub>3</sub>	1998.0934	McCammon, Idaho	I	1448.0917
Do.	U. P. 799	1998.5301	Near Onyx, Idaho	J	1407.7443
Near Point of Rocks, Wyo.	U. P. 804	1984.9296	Inkom, Idaho	K	1378.6475
Do.	I <sub>3</sub>	1983.7991	Do.	L	1377.2229
Do.	U. P. 810	1908.3447	Portneuf, Idaho	M	1367.1259
Near Salt Wells, Wyo.	J <sub>3</sub>	1948.2838	Pocatello, Idaho	A <sub>3</sub>	1358.2677
Near Baxter, Wyo.	U. P. 823	1920.3300	Do.	B <sub>3</sub>	1359.8535
Baxter, Wyo.	K <sub>3</sub>	1921.7654			
Rock Springs, Wyo.	L <sub>3</sub>	1909.2078	Pocatello, Idaho	C <sub>3</sub>	1363.1439
Do.	M <sub>3</sub>	1908.3570	Do.	City	1359.8320
Do.	N <sub>3</sub>	1912.0877	Do.	D <sub>3</sub>	1360.3023
Do.	O <sub>3</sub>	1916.4287	Do.	E <sub>3</sub>	1361.5549
Ab Say, Wyo.	U. P. 835	1895.2185	Near Pocatello, Idaho	F <sub>3</sub>	1343.5593
Near Wilkins, Wyo.	P <sub>3</sub>	1889.9250	Near Michaud, Idaho	G <sub>3</sub>	1349.6190
Wilkins, Wyo.	U. P. 839	1884.1882	Bannock, Idaho	H <sub>3</sub>	1344.2512
Greenriver, Wyo.	Q <sub>3</sub>	1854.9105	Near American Falls, Idaho	I <sub>3</sub>	1336.1028
Do.	R <sub>3</sub>	1864.6355			
Do.	S <sub>3</sub>	1858.2567	American Falls, Idaho	O. S. L.	1321.3474
Do.	T <sub>3</sub>	1855.1005	Near American Falls, Idaho	O. S. L.	1319.730
Near Peru, Wyo.	U <sub>3</sub>	1941.0297			
Near Bryan, Wyo.	V <sub>3</sub>	1884.0413	American Falls, Idaho	J <sub>3</sub>	1319.0684
Near Marston, Wyo.	W <sub>3</sub>	1883.1112	Near Napa, Idaho	K <sub>3</sub>	1364.1032
Do.	X <sub>3</sub>	1901.7718	Near Wapiti, Idaho	L <sub>3</sub>	1347.2644
Near Azusa, Wyo.	Y <sub>3</sub>	1896.9664	Wapi, Idaho	O. S. L.	1340.9424
Do.	T. B. M. 105	1901.4428	Near Wapi, Idaho	M <sub>3</sub>	1315.8465
			Near Yale, Idaho	N <sub>3</sub>	1297.6724
Ogden, Utah	B	1309.7019	Minidoka, Idaho	O. S. L.	1304.9845
Do.	A	1308.7087	Do.	P <sub>3</sub>	1303.3767
Do.	Transit	1331.3946	Near Colburne, Idaho	Q <sub>3</sub>	1297.9052
Do.	C	1310.3527	Do.	R <sub>3</sub>	1321.8322
Uinta, Utah	D	1370.1408	Kimama, Idaho	O. S. L.	1302.0284
Near Devils Gate, Utah	E	1408.2864	Do.	S <sub>3</sub>	1299.0580
Near Strawberry, Utah	F	1473.0581	Senter, Idaho	T <sub>3</sub>	1284.7451
Near Morgan, Utah	G	1534.6851	Owinza, Idaho	U <sub>3</sub>	1281.3355
Morgan, Utah	H	1542.5264	Near Owinza, Idaho	V <sub>3</sub>	1260.0902
Near Croydon, Utah	I	1593.9720	Dietrich, Idaho	W <sub>3</sub>	1240.4517
Echo, Utah	J	1604.2466	Shoshone, Idaho	X <sub>3</sub>	1209.3210
Do.	Geol. Echo	1605.6933	Do.	Y <sub>3</sub>	1207.8498
Near Emory, Utah	K	1748.7387	Do.	Z <sub>3</sub>	1208.9774
Emory, Utah	L	1802.4232	Near Tunupa, Idaho	A <sub>4</sub>	1141.7870
Castle Rock, Utah	M	1899.0114	Do.	B <sub>4</sub>	1129.4256
Wasatch, Utah	N	2076.8760	Gooding, Idaho	C <sub>4</sub>	1087.7942
Wyuta, Utah	O	2051.6097	Fuller, Idaho	D <sub>4</sub>	1036.2199
Evanston, Wyo.	6770 Evanston	2055.3128	Bliss, Idaho	E <sub>4</sub>	993.0584
Do.	A <sub>4</sub>	2056.6532	Ticeska, Idaho	F <sub>4</sub>	938.3765
Do.	6779 Evanston	2057.9699	King Hill, Idaho	G <sub>4</sub>	772.2392
Knight, Wyo.	B <sub>4</sub>	2151.9504	Glenns Ferry, Idaho	H <sub>4</sub>	779.5439
Altamont, Wyo.	C <sub>4</sub>	2199.9372	Do.	I <sub>4</sub>	785.0853
Springvalley, Wyo.	D <sub>4</sub>	2136.7411	Near Glenns Ferry, Idaho	J <sub>4</sub>	759.6246
Leroy, Wyo.	E <sub>4</sub>	2039.9629	Medbury, Idaho	K <sub>4</sub>	778.7185
Bridger, Wyo.	F <sub>4</sub>	2020.1605	Chalk Spur, Idaho	L <sub>4</sub>	879.2508
Near Bridger, Wyo.	G <sub>4</sub>	2005.6245	Near Mountain Home, Idaho	M <sub>4</sub>	937.0608
Carter, Wyo.	H <sub>4</sub>	*1980.5544	Mountain Home, Idaho	N <sub>4</sub>	958.3357
Do.	I <sub>4</sub>	1981.3513	Do.	O <sub>4</sub>	956.3591
Elkhurst, Wyo.	J <sub>4</sub>	1958.8088	Do.	P <sub>4</sub>	957.5845
Near Hampton, Wyo.	K <sub>4</sub>	1951.1126	Near Mountain Home, Idaho	Q <sub>4</sub>	969.4538
Church Buttes, Wyo.	L <sub>4</sub>	1935.0549	Do.	R <sub>4</sub>	980.9683
Do.	M <sub>4</sub>	1936.0333	Cleft, Idaho	S <sub>4</sub>	962.8079
Garrett, Wyo.	N <sub>4</sub>	1932.7477	Near Orchard, Idaho	T <sub>4</sub>	958.2812
Near Granger, Wyo.	O <sub>4</sub>	1911.0508	Do.	U <sub>4</sub>	911.8639
Granger, Wyo.	P <sub>4</sub>	1909.8539	Near Owyhee, Idaho	V <sub>4</sub>	908.9278
			Do.	W <sub>4</sub>	903.2772
Hot Springs, Utah	P	1301.2246	Owyhee, Idaho		903.5354
Willard, Utah	Q	1299.6109			
Brigham, Utah	R	1308.5197	Near Mora, Idaho	X <sub>4</sub>	862.2010
Honeyville, Utah	S	1298.0129	Mora, Idaho	Y <sub>4</sub>	842.8458
Dewey, Utah	T	1316.9440	Near Mora, Idaho	Z <sub>4</sub>	837.7936
Bear River, Utah	U	1369.8939	Near Kuna, Idaho	A <sub>5</sub>	805.6499
Cache Junction, Utah	V	1355.4177	Do.	B <sub>5</sub>	804.9106
Do.	W	1353.1733	Do.	C <sub>5</sub>	798.4133
Ransom, Utah	X	1358.7412	Near Nampa, Idaho	D <sub>5</sub>	775.4200
Near Cornish, Utah	Y	1378.4519	Nampa, Idaho	E <sub>5</sub>	757.8833
Weston, Idaho	A	1402.9055			
Dayton, Idaho	B	1445.6464			

\* This bench mark was reported in 1905 as having sunk about 0.052 meter.



## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Nampa, Idaho.....	F <sub>1</sub> .....	758.7768	Pleasant Valley, Oreg.....	3818A.....	1166.1736
Do.....	H <sub>1</sub> .....	757.8613	Near Encina, Oreg.....	G <sub>1</sub> .....	1205.1009
Do.....	G <sub>1</sub> .....	758.0259	Near Norton, Oreg.....	H <sub>1</sub> .....	1132.4387
Do.....	I <sub>1</sub> .....	756.8013	Norton, Oreg.....	3846A.....	1113.5760
Do.....	O. S. L.....	756.8481	Near Baker City, Oreg.....	I <sub>1</sub> .....	1065.2470
Near Nampa, Idaho.....	J <sub>1</sub> .....	743.2705	Baker City, Oreg.....	3433A.....	1048.5434
Do.....	K <sub>1</sub> .....	737.8446	Do.....	J <sub>1</sub> .....	1049.3511
Near Caldwell, Idaho.....	L <sub>1</sub> .....	725.2358	Do.....	K <sub>1</sub> .....	1050.3551
Caldwell, Idaho.....	M <sub>1</sub> .....	723.5869	Do.....	L <sub>1</sub> .....	1050.9800
Do.....	N <sub>1</sub> .....	722.9449	Near Baker City, Oreg.....	M <sub>1</sub> .....	1027.8123
Do.....	O <sub>1</sub> .....	721.7010	Near Wingville, Oreg.....	3338A.....	1019.6697
Do.....	P <sub>1</sub> .....	722.8993	Near Haines, Oreg.....	N <sub>1</sub> .....	1013.9917
Near Caldwell, Idaho.....	Q <sub>1</sub> .....	717.0585	Do.....	O <sub>1</sub> .....	1018.1470
Do.....	R <sub>1</sub> .....	711.1626	Hutchinson, Oreg.....	3372A.....	1029.9081
Near Notus, Idaho.....	S <sub>1</sub> .....	703.3662	Near North Powder, Oreg.....	P <sub>1</sub> .....	1003.4148
Do.....	T <sub>1</sub> .....	697.8679	North Powder, Oreg.....	3233A.....	988.0047
Near Parma, Idaho.....	U <sub>1</sub> .....	682.2232	Do.....	Q <sub>1</sub> .....	992.3639
Do.....	O. S. L.....	677.5094	Near North Powder, Oreg.....	R <sub>1</sub> .....	975.0941
Do.....	V <sub>1</sub> .....	672.3381	Do.....	S <sub>1</sub> .....	971.8088
In Idaho, near Nyssa, Oreg.....	W <sub>1</sub> .....	670.8590	Do.....	T <sub>1</sub> .....	971.7284
Do.....	X <sub>1</sub> .....	667.1375	Do.....	3228A.....	985.9333
Near Nyssa, Oreg.....	F <sub>1</sub> .....	665.6189	Near Telocaset, Oreg.....	U <sub>1</sub> .....	1005.6656
Do.....	G <sub>1</sub> .....	664.4767	Do.....	V <sub>1</sub> .....	1047.8171
Do.....	H <sub>1</sub> .....	660.3926	Do.....	3440A.....	1050.3309
Near Ontario, Oreg.....	J <sub>1</sub> .....	657.5738	Do.....	W <sub>1</sub> .....	989.7547
Do.....	I <sub>1</sub> .....	655.2099	Near Union Station, Oreg.....	3021A.....	922.4778
Ontario, Oreg.....	2143H.....	655.4967	Do.....	X <sub>1</sub> .....	857.1060
Do.....	K <sub>1</sub> .....	656.7759	Union, Oreg.....	Y <sub>1</sub> .....	851.0189
Do.....	L <sub>1</sub> .....	656.5708	Do.....	Z <sub>1</sub> .....	849.9302
Do.....	M <sub>1</sub> .....	656.7551	Do.....	O. S. Union.....	849.7755
Do.....	N <sub>1</sub> .....	654.5774	Do.....	A <sub>1</sub> .....	851.0787
Near Payette, Idaho.....	Y <sub>1</sub> .....	654.4766	Near Union Station, Oreg.....	2705A.....	826.2569
Do.....	2139H (1).....	654.2623	Do.....	B <sub>1</sub> .....	822.9320
Do.....	Z <sub>1</sub> .....	653.3191	Do.....	2696A.....	823.3401
Payette, Idaho.....	A <sub>1</sub> .....	654.7671	Near La Grande, Oreg.....	C <sub>1</sub> .....	825.1807
Do.....	B <sub>1</sub> .....	655.7303	Do.....	D <sub>1</sub> .....	832.2609
Do.....	C <sub>1</sub> .....	655.2883	La Grande, Oreg.....	2773A.....	846.9688
Near Payette, Idaho.....	2138H (2).....	654.0540	Do.....	E <sub>1</sub> .....	848.7219
Near Crystal, Idaho.....	2123H.....	649.3066	Do.....	F <sub>1</sub> .....	849.6579
Do.....	D <sub>1</sub> .....	647.9487	Do.....	G <sub>1</sub> .....	849.1431
Near Weiser, Idaho.....	2112H.....	645.9594	Do.....	2782A.....	849.5404
Do.....	E <sub>1</sub> .....	645.9111	Near La Grande, Oreg.....	H <sub>1</sub> .....	867.8409
Do.....	2113H.....	646.1816	Do.....	I <sub>1</sub> .....	871.2281
Do.....	F <sub>1</sub> .....	642.1951	Perry, Oreg.....	2867A.....	884.6665
Weiser, Idaho.....	2107H.....	644.3765	Near Hilgard, Oreg.....	J <sub>1</sub> .....	904.2212
Do.....	G <sub>1</sub> .....	646.4938	Hilgard, Oreg.....	3001A.....	916.5424
Do.....	H <sub>1</sub> .....	646.5907	Near Hilgard, Oreg.....	3581A.....	1083.5890
Near Eaton, Idaho.....	2122H.....	649.0157	Near Kamela, Oreg.....	K <sub>1</sub> .....	1023.5348
Do.....	I <sub>1</sub> .....	644.1886	Kamela, Oreg.....	4199A.....	1281.8829
Do.....	2097H.....	641.2453	Near Meacham, Oreg.....	3955A.....	1208.4952
Do.....	J <sub>1</sub> .....	639.4057	Do.....	L <sub>1</sub> .....	1145.1079
Near Olds Ferry, Idaho.....	2087H.....	638.2089	Meacham, Oreg.....	3672A.....	1121.3551
Do.....	2086H.....	637.9228	Near Meacham, Oreg.....	3454A.....	1054.6907
Olds Ferry, Idaho.....	K <sub>1</sub> .....	631.5800	Do.....	M <sub>1</sub> .....	1021.4137
Near Olds Ferry, Idaho.....	2070H.....	633.0367	Do.....	N <sub>1</sub> .....	971.8475
Do.....	2068H.....	632.9017	Do.....	O <sub>1</sub> .....	933.1451
Near Huntington, Oreg.....	2079A.....	635.6742	Do.....	P <sub>1</sub> .....	881.9109
Do.....	Q <sub>1</sub> .....	635.8013	Do.....	Q <sub>1</sub> .....	846.2394
Do.....	R <sub>1</sub> .....	647.9962	Near North Fork, Oreg.....	2570A.....	784.9869
Do.....	S <sub>1</sub> .....	638.8458	Do.....	R <sub>1</sub> .....	780.7264
Huntington, Oreg.....	2105A.....	643.8640	Do.....	S <sub>1</sub> .....	755.7841
Do.....	T <sub>1</sub> .....	644.6206	Do.....	T <sub>1</sub> .....	745.3687
Near Huntington, Oreg.....	U <sub>1</sub> .....	649.5082	Do.....	2264A.....	691.5983
Do.....	V <sub>1</sub> .....	654.7228	Do.....	U <sub>1</sub> .....	684.7751
Do.....	W <sub>1</sub> .....	659.7467	Do.....	V <sub>1</sub> .....	657.7686
Do.....	2215A.....	677.2659	Near Bingham Spgs., Oreg.....	2023A.....	617.9814
Do.....	X <sub>1</sub> .....	679.0962	Do.....	W <sub>1</sub> .....	590.0002
Do.....	Y <sub>1</sub> .....	683.3083	Do.....	X <sub>1</sub> .....	554.6063
Near Weatherby, Oreg.....	2369A.....	695.5237	Bingham Springs, Oreg.....	1744A.....	533.0797
Do.....	Z <sub>1</sub> .....	724.1856	Near Bingham Spgs., Oreg.....	Y <sub>1</sub> .....	503.8473
Do.....	A <sub>1</sub> .....	734.2845	Near Cayuse, Oreg.....	1523A.....	465.6503
Do.....	B <sub>1</sub> .....	735.1246	Do.....	Z <sub>1</sub> .....	463.6016
Near Durkee, Oreg.....	2518A.....	769.7642	Do.....	A <sub>1</sub> .....	436.9213
Do.....	B <sub>1</sub> .....	780.4082	Near Mission, Oreg.....	B <sub>1</sub> .....	427.9117
Durkee, Oreg.....	2647A.....	808.8821	Do.....	C <sub>1</sub> .....	414.0079
Near Durkee, Oreg.....	C <sub>1</sub> .....	833.9199	Mission, Oreg.....	1205A.....	405.1760
Do.....	D <sub>1</sub> .....	858.5901	Pendleton, Oreg.....	D <sub>1</sub> .....	368.4184
Unity, Oreg.....	3139A.....	958.8135	Do.....	E <sub>1</sub> .....	326.5615
Near Unity, Oreg.....	E <sub>1</sub> .....	957.0800	Do.....	F <sub>1</sub> .....	325.8819
Near Pleasant Valley, Oreg.....	F <sub>1</sub> .....	1076.7484	Do.....	1074A.....	327.7091
			Near Pendleton, Oreg.....	G <sub>1</sub> .....	328.4503
					334.6494

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Pendleton, Oreg.	H <sub>1</sub>	357.6678	Canyon, Wash.	V <sub>1</sub>	395.0993
Near Fulton, Oreg.	L <sub>1</sub>	422.7672	Roza, Wash.	1249T	380.7718
Near McCormack, Oreg.	J <sub>1</sub>	503.5791	Do.	W <sub>1</sub>	379.5059
Near Warren, Oreg.	K <sub>1</sub>	530.0455	Selah, Wash.	1147T	349.7685
Near Helix, Oreg.	L <sub>1</sub>	548.2186	Near Selah, Wash.	X <sub>1</sub>	347.0646
Near Killian Jct., Oreg.	M <sub>1</sub>	542.6757	Near Wenas, Wash.	Y <sub>1</sub>	334.5236
Do.	N <sub>1</sub>	507.0533	North Yakima, Wash.	1067T	325.2738
Near Stanton, Oreg.	O <sub>1</sub>	474.3193	Do.	Z <sub>1</sub>	324.6050
Near Canon, Oreg.	P <sub>1</sub>	317.6066	Do.	A <sub>1</sub>	325.3765
Near Hunts Junction, Wash.	R <sub>1</sub>	244.5562	Do.	B <sub>1</sub>	323.8444
Do.	Q <sub>1</sub>	144.1107	Do.	C <sub>1</sub>	325.6906
			Near Yakima City, Wash.	D <sub>1</sub>	290.2743
Seattle, Wash.	Tidal 5	6.5641	Wapato, Wash.	855T	260.6277
Do.	Tidal 4	6.0539	Do.	E <sub>1</sub>	260.1754
Do.	G	7.6538	Near Wapato, Wash.	F <sub>1</sub>	247.6587
Do.	City 1	7.5700	Toppenish, Wash.	755T	230.2337
Do.	City 2	3.3356	Do.	G <sub>1</sub>	229.8296
South Seattle, Wash.	City 3	3.1382	Do.	H <sub>1</sub>	230.4166
Near Argo, Wash.	N. P.	6.1443	Near Alfalfa, Wash.	717T	218.4257
Near Black River, Wash.	N. P.	6.5225	Alfalfa, Wash.	I <sub>1</sub>	217.7469
Black River, Wash.	H	6.2592	Satus, Wash.	674T	205.4120
Near Black River, Wash.	I	10.4242	Near Satus, Wash.	J <sub>1</sub>	203.8203
Kent, Wash.	J	12.2957	Near Mabton, Wash.	717T	218.3246
Do.	K	12.9236	Mabton, Wash.	715T	217.9719
Near Thomas, Wash.	L	16.1007	Near Mabton, Wash.	K <sub>1</sub>	217.3660
Auburn, Wash.	M	22.6079	Byron, Wash.	666T	212.2296
Do.	N	25.5175	Near Byron, Wash.	L <sub>1</sub>	210.5946
Near Auburn, Wash.	O	30.3121	Prosser, Wash.	M <sub>1</sub>	201.3897
Near Covington, Wash.	P	100.8099	Do.	661T	201.5281
Covington, Wash.	Q	105.5491	Do.	N <sub>1</sub>	203.3167
Near Ravensdale, Wash.	R	175.7399	Do.	O <sub>1</sub>	201.5827
Ravensdale, Wash.	S	188.5441	Near Prosser, Wash.	P <sub>1</sub>	205.2411
Near Ravensdale, Wash.	T	198.4650	Gibbon, Wash.	627T	191.1617
Do.	U	214.9878	Chandler, Wash.	534T	162.8245
Near Palmer Jct., Wash.	V	258.4427	Near Klona, Wash.	Q <sub>1</sub>	148.3923
Palmer Junction, Wash.	W	261.5774	Klona, Wash.	515T	156.8511
Near Palmer Jct., Wash.	X	284.1440	Do.	R <sub>1</sub>	156.6186
Near Eagle Gorge, Wash.	1046T	319.0275	Near Klona, Wash.	S <sub>1</sub>	164.2670
Do.	Y	329.2389	Near Badger, Wash.	640T	195.1219
Canton, Wash.	Z	367.1483	Badger, Wash.	T <sub>1</sub>	206.1520
Do.	1205T	367.6079	Near Badger, Wash.	605T	184.3821
Maywood, Wash.	1335T	407.2059	Relief, Wash.	567T	172.7454
Hot Springs, Wash.	1531T	466.9773	Near Relief, Wash.	U <sub>1</sub>	171.6151
Do.	A <sub>1</sub>	462.7564	Kennewick, Wash.	V <sub>1</sub>	111.9906
Near Hot Springs, Wash.	B <sub>1</sub>	479.6763	Do.	362T	110.2139
Lester, Wash.	1614T	492.2723	Do.	W <sub>1</sub>	108.1600
Near Weston, Wash.	C <sub>1</sub>	601.8837	Near Kennewick, Wash.	X <sub>1</sub>	107.2836
Near Borup, Wash.	D <sub>1</sub>	656.9620	Near Pasco, Wash.	Y <sub>1</sub>	107.2097
Stampede, Wash.	2776T	846.5199	Do.	Z <sub>1</sub>	114.7485
Near Stampede, Wash.	E <sub>1</sub>	856.6532	Pasco, Wash.	378T	115.1234
Do.	F <sub>1</sub>	868.5084	Do.	A <sub>1</sub>	115.1780
Martin, Wash.	2782T	848.5594	Near Pasco, Wash.	B <sub>1</sub>	108.8659
Near Easton, Wash.	G <sub>1</sub>	682.3803	Do.	C <sub>1</sub>	108.9065
Easton, Wash.	H <sub>1</sub>	660.4135	Do.	D <sub>1</sub>	108.9003
Do.	I <sub>1</sub>	* 661.4747	Do.	E <sub>1</sub>	108.8961
Near Nelson, Wash.	J <sub>1</sub>	632.1821	Do.	F <sub>1</sub>	108.9085
Nelson, Wash.	2030T	619.1910	Do.	G <sub>1</sub>	108.8919
Clealum, Wash.	K <sub>1</sub>	582.3061	Do.	H <sub>1</sub>	108.9073
Do.	L <sub>1</sub>	583.3568	Do.	I <sub>1</sub>	108.8729
Do.	M <sub>1</sub>	582.0112	Near Hunts Jct., Wash.	341A	104.4478
Teanaway, Wash.	1838T	560.3330	Do.	J <sub>1</sub>	99.7498
Bristol, Wash.	1784T	544.0797	Do.	K <sub>1</sub>	104.1103
Near Bristol, Wash.	N <sub>1</sub>	533.8108	Hunts Junction, Wash.	L <sub>1</sub>	98.9122
Near Thorp, Wash.	O <sub>1</sub>	521.6953	Do.	M <sub>1</sub>	97.7218
Do.	1658T	505.6595	Near Hunts Jct., Wash.	N <sub>1</sub>	121.3500
Thorp, Wash.	1634T	498.1126	Do.	O <sub>1</sub>	122.6823
Do.	P <sub>1</sub>	497.8513	Do.	P <sub>1</sub>	127.3261
Near Thorp, Wash.	U. S. Base	463.0453			
Ellensburg, Wash.	Q <sub>1</sub>	462.0684	East St. Cloud, Minn.	Hydrant 1	316.5037
Do.	1571T	478.9806	Do.	P. B. M. "†"	312.8655
Do.	R <sub>1</sub>	468.3844	St. Cloud, Minn.	Top of cap†	314.0716
Do.	S <sub>1</sub>	461.7191	Do.	do†	314.0865
Thrall, Wash.	T <sub>1</sub>	435.3055	Do.	A	316.7557
Umtanum, Wash.	1350T	411.4868	Do.	Hydrant 2	316.2818
Near Umtanum, Wash.	U <sub>1</sub>	407.6635	Do.	Hydrant 3	316.1964

\* In 1907 this bench mark was moved to a new position and reset, and its elevation redetermined by the engineers of the C. M. & St. P. Ry. The difference of elevation of the bench mark, in the old position and in the new position, as determined by them, was, new — old = +1.135 ft. = 0.3459 meter.

† In position as found.

‡ Reset.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
St. Cloud, Minn.....	Hydrant 4.....	317.0668	Near Childs, Minn.....	Foss Reference Mark..	297.3419
Do.....	B.....	320.0196	Do.....	J.....	285.9862
Near St. Cloud, Minn.....	C.....	319.7504	Near Fairmount, N. Dak..	969 W.....	285.7528
Do.....	D.....	318.3187	Fairmount, N. Dak.....	C.....	300.5993
St. Joseph, Minn.....	E.....	332.5936	Do.....	D.....	300.5257
Collegeville, Minn.....	F.....	334.3133	Near Blackmer, N. Dak..	E.....	296.9515
Do.....	G.....	334.0444	Do.....	F.....	297.4631
Near Avon, Minn.....	H.....	345.0490	Do.....	G.....	297.2602
Avon, Minn.....	I.....	345.3442	White Rock, S. Dak.....	A.....	297.5643
Do.....	J.....	344.7116	Do.....	B.....	297.9182
Near Albany, Minn.....	K.....	361.0916	Do.....	C.....	296.9309
Albany, Minn.....	Hydrant 5.....	368.5420	In Minnesota, near White	K.....	302.2208
Do.....	L.....	368.0640	Rock, S. Dak.....		
Freeport, Minn.....	M.....	378.3170	Do.....	L.....	307.5090
Do.....	N.....	379.4202	Near Wheaton, Minn.....	M.....	316.1484
Do.....	Hydrant 6.....	380.1385	Near White Rock, S. Dak.	Oscarson A.....	317.5640
Near Melrose, Minn.....	O.....	360.5137	Do.....	Oscarson Ref. Mark..	316.7377
Melrose, Minn.....	P.....	369.4734	Wheaton, Minn.....	N.....	311.2932
Do.....	City 1.....	370.3176	Do.....	City.....	311.1975
Do.....	City 2.....	370.3366	Do.....	O.....	311.3850
Do.....	City 3.....	370.4658	Near Wheaton, Minn.....	P.....	312.5036
Do.....	City 4.....	370.0488	Near Dumont, Minn.....	Q.....	317.4544
Do.....	Q.....	368.3208	Dumont, Minn.....	R.....	319.3190
Near Melrose, Minn.....	R.....	369.4518	Do.....	S.....	317.7372
Near Sauk Center, Minn.....	S.....	382.3684	Near Dumont, Minn.....	T.....	320.8834
Sauk Center, Minn.....	T.....	383.8937	Collis, Minn.....	U.....	325.0873
Do.....	U.....	384.1219	Near Collis, Minn.....	V.....	326.6183
Do.....	Hydrant 7.....	383.1981	Near Graceville, Minn.....	W.....	329.5058
Do.....	Hydrant 8.....	382.0415	Do.....	X.....	335.8188
Do.....	Hydrant 9.....	381.4375	Graceville, Minn.....	City.....	339.2314
Near West Union, Minn.....	V.....	391.9639	Do.....	Y.....	338.9959
West Union, Minn.....	W.....	406.5894	Do.....	Z.....	339.1925
Do.....	X.....	408.8999	Do.....	A.....	338.0788
Near West Union, Minn.....	Y.....	408.4985	Near Graceville, Minn.....	B.....	338.9654
Near Osakis, Minn.....	Z.....	414.6958	Do.....	C.....	348.5628
Do.....	A.....	424.6638	Do.....	D.....	353.0642
Do.....	Osakis A.....	428.4332	Near Clinton, Minn.....	E.....	361.3493
Osakis, Minn.....	B.....	410.1411	Clinton, Minn.....	F.....	354.4589
Do.....	C.....	412.2168	Do.....	G.....	354.5639
Do.....	D.....	410.7381	Near Clinton, Minn.....	H.....	349.8367
Near Osakis, Minn.....	E.....	423.6044	Ortonville, Minn.....	I.....	352.1067
Near Nelson, Minn.....	F.....	412.0195	Near Ortonville, Minn.....	J.....	338.6317
Nelson, Minn.....	G.....	417.3212	Do.....	K.....	336.6463
Near Alexandria, Minn.....	Alexandria A.....	451.2818	Ortonville, Minn.....	L.....	311.8297
Do.....	Alexandria Ref. Mark.	450.7846	Do.....	U. S. E. 1.....	298.6503
Do.....	H.....	431.6131	Do.....	U. S. E. 2.....	295.6085
Alexandria, Minn.....	I.....	424.3007	Do.....	U. S. E. 3.....	296.3756
Do.....	J.....	424.8073	Near Bigstone City, S. Dak.	D.....	297.0653
Do.....	K.....	428.3393	Do.....	E.....	320.2810
Do.....	Alexandria Mag. Sta..	428.9145	Do.....	F.....	320.0728
Do.....	L.....	431.7668	Near Milbank, S. Dak.....	G.....	324.9202
Do.....	City.....	431.3880	Milbank, S. Dak.....	H.....	349.6153
Near Garfield, Minn.....	M.....	423.5907	Near Milbank, S. Dak.....	I.....	351.0214
Garfield, Minn.....	N.....	433.9498	Near Milbank, S. Dak.....	J.....	350.9923
Brandon, Minn.....	O.....	430.7631	Near Twinbrooks, S. Dak.	K.....	378.0703
Do.....	P.....	430.5646	Twinbrooks, S. Dak.....	L.....	384.9462
Do.....	Q.....	432.4382	Stockholm, S. Dak.....	M.....	507.3563
Evansville, Minn.....	S.....	414.6925	Southshore, S. Dak.....	N.....	568.0801
Do.....	T.....	414.6512	Do.....	O.....	570.4209
Erdahl, Minn.....	U.....	386.1084	Near Southshore, S. Dak.	Mound A.....	634.8725
Thorsborg, Minn.....	V.....	367.2758	Do.....	Mound Ref. Mark..	626.1602
Near Elbow Lake, Minn.....	Elbow A.....	390.0919	Near Forestville, S. Dak..	P.....	578.6360
Do.....	W.....	372.8040	Near Watertown, S. Dak.	Q.....	544.1458
Elbow Lake, Minn.....	X.....	369.9983	Do.....	R.....	530.5301
Do.....	Y.....	369.8751	Do.....	S.....	527.0654
Near Elbow Lake, Minn.....	Z.....	366.8096	Watertown, S. Dak.....	T.....	530.6725
Do.....	A.....	363.4249	Do.....	City 1.....	530.9595
Near Hereford, Minn.....	B.....	344.4594	Do.....	U.....	529.4196
Do.....	C.....	313.9751	Do.....	City 2.....	530.8349
Tintah, Minn.....	D.....	304.1643	Do.....	Watertown Mag. Sta.	528.8620
Do.....	E.....	305.4066			
Near Tintah, Minn.....	F.....	302.4207	Watertown, S. Dak.....	V.....	523.9901
Near Yarmouth, Minn.....	G.....	300.7586	Near Grover, S. Dak.....	W.....	532.7770
Near Tenney, Minn.....	H.....	299.4952	Grover, S. Dak.....	X.....	530.8383
Childs, Minn.....	I.....	297.5195	Near Grover, S. Dak.....	Y.....	523.8825
Near Fairmount, N. Dak.	A.....	300.1862	Hazel, S. Dak.....	Z.....	538.9786
Do.....	B.....	297.7631	Do.....	A.....	538.9188
Do.....	979 W *.....	298.9683	Do.....	B.....	536.8268
Do.....	979 W †.....	298.7354	Near Hazel, S. Dak.....	C.....	546.7220
Do.....	971 W.....	296.1286	Do.....	D.....	546.4006
Near Childs, Minn.....	Foss A.....	297.2442			

\* In position as found.

† Reset.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Vienna, S. Dak.	E <sub>1</sub>	546.4556	Sioux Falls, S. Dak.	K <sub>1</sub>	427.4672
Do.	F <sub>1</sub>	558.1832	Near Harrisburg, S. Dak.	1484 YNKTN	452.5906
Vienna, S. Dak.	G <sub>1</sub>	558.1861	Do.	M <sub>1</sub>	450.9881
Near Vienna, S. Dak.	H <sub>1</sub>	554.2034	Do.	N <sub>1</sub>	442.0464
Near Bryant, S. Dak.	I <sub>1</sub>	558.7618	Harrisburg, S. Dak.	O <sub>1</sub>	435.8614
Do.	J <sub>1</sub>	558.8906	Near Harrisburg, S. Dak.	1419 YNKTN	432.8318
Do.	S. C. 1	562.9152	Do.	P <sub>1</sub>	429.8909
Bryant, S. Dak.	K <sub>1</sub>	562.3896	Do.	Q <sub>1</sub>	424.5695
Do.	L <sub>1</sub>	564.7417	Near Canton, S. Dak.	R <sub>1</sub>	408.8317
Near Bryant, S. Dak.	M <sub>1</sub>	557.9152	Canton, S. Dak.	S <sub>1</sub>	388.4640
Do.	S. C. 2	547.1988	Do.	T <sub>1</sub>	386.9351
Erwin, S. Dak.	N <sub>1</sub>	568.1406	Beloit, Iowa	A	379.0223
Near Erwin, S. Dak.	O <sub>1</sub>	561.2615	Do.	B	380.4555
Do.	P <sub>1</sub>	550.6072	Near Beloit, Iowa	C	377.2623
Near Lake Preston, S. Dak.	Q <sub>1</sub>	519.4835	Near Elm Springs, Iowa	D	390.5723
Lake Preston, S. Dak.	R <sub>1</sub>	525.6984	Fairview, S. Dak.	E	370.4694
Do.	S <sub>1</sub>	524.4568	Near Fairview, S. Dak.	V <sub>1</sub>	368.6910
Do.	Preston	524.4150	Do.	W <sub>1</sub>	369.7086
Near Lake Preston, S. Dak.	T <sub>1</sub>	523.6733	Do.	X <sub>1</sub>	367.6931
Do.	U <sub>1</sub>	516.2530	Near Austin, Iowa	E	366.2511
Do.	S. C. 3	522.6019	Hudson, S. Dak.	Y <sub>1</sub>	373.1389
Do.	Hansen A	529.5747	Do.	Z <sub>1</sub>	372.7232
Do.	Hansen Ref. Mark	527.3671	Near Hudson, S. Dak.	A <sub>1</sub>	368.9829
Oldham, S. Dak.	V <sub>1</sub>	524.8222	Do.	B <sub>1</sub>	365.9156
Do.	W <sub>1</sub>	526.6188	Near Hawarden, Iowa	F	360.8465
Near Oldham, S. Dak.	X <sub>1</sub>	527.2133	Do.	G	358.2916
Do.	Y <sub>1</sub>	527.6523	Calliope, Iowa	H	360.5346
Ramona, S. Dak.	Z <sub>1</sub>	550.0025	Hawarden, Iowa	I	360.2558
Near Ramona, S. Dak.	A <sub>1</sub>	549.1863	Do.	City	358.2487
Do.	B <sub>1</sub>	548.5054	Near Hawarden, Iowa	J	357.8246
Do.	C <sub>1</sub>	542.0558	Do.	K	357.3954
Do.	D <sub>1</sub>	530.0449	Do.	L	355.5955
Do.	S. C. 4	527.4357	Near Chatsworth, Iowa	M	352.5586
Do.	S. C. 5	539.6027	Chatsworth, Iowa	N	353.9099
Do.	S. C. 6	547.8933	Do.	O	354.4951
Do.	E <sub>1</sub>	563.9123	Near Chatsworth, Iowa	P	352.2376
Do.	S. C. 7	558.9775	Near Akron, Iowa	Q	347.4498
Do.	Crane Ref. Mark	553.5631	Akron, Iowa	R	349.7805
Do.	Crane A	565.8185	Do.	City	349.4303
Near Madison, S. Dak.	F <sub>1</sub>	528.6548	Near Akron, Iowa	S	346.7485
Madison, S. Dak.	G <sub>1</sub>	513.6311	Do.	T	346.2906
Do.	H <sub>1</sub>	510.4403	Near Westfield, Iowa	U	344.5897
Do.	I <sub>1</sub>	511.2597	Do.	V	344.7927
Do.	City 2	509.8125	Do.	W	342.3572
Do.	City 3	509.5934	Do.	X	343.9686
Near Madison, S. Dak.	J <sub>1</sub>	521.6660	Do.	Y	340.6596
Do.	K <sub>1</sub>	520.1948	Do.	Z	341.1831
Wentworth, S. Dak.	L <sub>1</sub>	516.9501	Near Elk Point, S. Dak.	C	342.2227
Near Wentworth, S. Dak.	M <sub>1</sub>	516.4343	Elk Point, S. Dak.	P. B. M. 299	342.7147
Do.	N <sub>1</sub>	512.4302	Near Elk Point, S. Dak.	D	343.5812
Colman, S. Dak.	O <sub>1</sub>	517.2330	Do.	E	342.3270
Near Colman, S. Dak.	P <sub>1</sub>	517.8560	Do.	F	340.4718
Do.	Q <sub>1</sub>	524.5250	Jefferson, S. Dak.	G	339.5916
Do.	R <sub>1</sub>	512.9774	Do.	P. B. M. 299	338.4686
Do.	S <sub>1</sub>	506.1312	Do.	H	340.3660
Near Egan, S. Dak.	T <sub>1</sub>	461.7566	Do.	I	340.0638
Do.	U <sub>1</sub>	461.1338	Near Jefferson, S. Dak.	J	339.7300
Near Trent, S. Dak.	S. C. 8	458.5199	Do.	K	338.8119
Trent, S. Dak.	V <sub>1</sub>	457.5951	McCook, S. Dak.	L	337.9224
Near Trent, S. Dak.	W <sub>1</sub>	454.5301	Do.	P. B. M. 299	337.2166
Dell Rapids, S. Dak.	X <sub>1</sub>	456.5637	Near McCook, S. Dak.	M	337.8798
Do.	City 1	457.6201	Do.	N	336.5029
Do.	Y <sub>1</sub>	457.1322	Near Sioux City, Iowa	P. B. M. 309	335.1723
Do.	City 2	457.3124	Do.	Top of cap over same	336.3930
Do.	Z <sub>1</sub>	454.0988	Do.	P. B. M. 308	336.5279
Near Dell Rapids, S. Dak.	A <sub>1</sub>	455.0717	Do.	Top of cap over same	337.7500
Do.	B <sub>1</sub>	450.3548			
Do.	S. C. 9	449.4311			
Baltic, S. Dak.	C <sub>1</sub>	449.3724	Brandon, Minn.	R <sub>1</sub>	423.2044
Near Baltic, S. Dak.	D <sub>1</sub>	445.2110	Near Evansville, Minn.	M	417.4756
Do.	E <sub>1</sub>	443.4433	Melby, Minn.	N	399.6986
Do.	F <sub>1</sub>	442.7494	Near Melby, Minn.	O	373.0424
Renner, S. Dak.	G <sub>1</sub>	438.5250	Ashby, Minn.	P	394.9247
Do.	H <sub>1</sub>	437.9614	Do.	Q	396.1322
Near Sioux Falls, S. Dak.	I <sub>1</sub>	434.2710	Near Ashby, Minn.	R	384.2921
Do.	J <sub>1</sub>	433.5483	Dalton, Minn.	S	421.3607
Sioux Falls, S. Dak.	City 1	426.2179	Do.	Dalton Astro. Sta.	420.0514
Do.	City 2	427.7601	Do.	T	416.5441
Do.	City 4	427.4905	Near Dalton, Minn.	Dalton A	423.3156
Do.	L <sub>1</sub>	428.8595	Do.	U	379.0280
Do.	City 3	430.6601	Parkdale, Minn.	V	375.9749
Do.	U. S. G. S. Ast. Sta.	434.7174	Near Fergus Falls, Minn.	W	367.5461

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Fergus Falls, Minn.	X <sub>3</sub>	364.4451	Holland, Tex.	Z <sub>4</sub>	* 160.5200
Do.	Y <sub>1</sub>	364.5387	Near Bartlett, Tex.	A <sub>3</sub>	180.2080
Do.	City	362.9226	Granger, Tex.	B <sub>3</sub>	175.4671
Do.	Z <sub>3</sub>	363.6045	Do.	C <sub>3</sub>	175.4366
Near Fergus Falls, Minn.	A <sub>1</sub>	366.7730	Near Circleville, Tex.	D <sub>3</sub>	164.5839
Do.	B <sub>1</sub>	360.3677	Taylor, Tex.	E <sub>3</sub>	166.0087
Carlisle, Minn.	C <sub>1</sub>	373.4899	Do.	F <sub>3</sub>	168.4433
Near Carlisle, Minn.	D <sub>1</sub>	373.5771	Coupland, Tex.	526 Coupland	157.5949
Near Rothsay, Minn.	E <sub>1</sub>	421.9998	Near Coupland, Tex.	G <sub>3</sub>	160.3633
Rothsay, Minn.	F <sub>1</sub>	364.4083	Elgin, Tex.	576 S. A.	173.1297
Do.	G <sub>1</sub>	366.2581			
Do.	H <sub>1</sub>	369.0053			
Near Rothsay, Minn.	I <sub>1</sub>	344.2608	Littig, Tex.	K <sub>3</sub>	140.5457
Lawndale, Minn.	J <sub>1</sub>	326.1647	Manor, Tex.	L <sub>3</sub>	163.0038
Near Lawndale, Minn.	K <sub>1</sub>	318.1111	Daffan, Tex.	M <sub>3</sub>	185.4536
Near Barnesville, Minn.	L <sub>1</sub>	315.3729	Near Austin, Tex.	N <sub>3</sub>	137.1454
Do.	M <sub>1</sub>	312.7589	Austin, Tex.	Geol. Austin	141.8973
Barnesville, Minn.	N <sub>1</sub>	315.6199	Do.	P <sub>3</sub>	146.0929
Do.	O <sub>1</sub>	312.7135	Do.	O <sub>3</sub>	149.4489
Near Barnesville, Minn.	P <sub>1</sub>	301.5708	Do.	North Meridian Mark	166.1009
Do.	Q <sub>1</sub>	290.6014	Do.	508 Austin	153.0438
Downer, Minn.	R <sub>1</sub>	294.7848	Near Austin, Tex.	476 Austin	143.2432
Do.	S <sub>1</sub>	295.3493	Do.	Barton Δ	315.7015
Near Downer, Minn.	T <sub>1</sub>	291.1948			
Near Crawford, Minn.	U <sub>1</sub>	283.9139	Elgin, Tex.	H <sub>3</sub>	175.2537
Near Glyndon, Minn.	V <sub>1</sub>	282.0504	Near Elgin, Tex.	I <sub>3</sub>	166.0697
Glyndon, Minn.	W <sub>1</sub>	281.7778	Near Sayers, Tex.	J <sub>3</sub>	120.9687
Near Averill, Minn.	X <sub>1</sub>	279.7076	Do.	Q <sub>3</sub>	130.8091
Averill, Minn.	Y <sub>1</sub>	279.8424	Do.	449 S. A.	134.4157
Near Felton, Minn.	Z <sub>1</sub>	279.7688	Near Bastrop, Tex.	460 S. A.	137.9368
Felton, Minn.	A <sub>3</sub>	278.4472	Do.	R <sub>3</sub>	132.2620
Do.	B <sub>3</sub>	278.3294	Do.	365 S. A.	108.9346
Near Borup, Minn.	C <sub>3</sub>	277.5108	Bastrop, Tex.	372 Bastrop	111.7252
Borup, Minn.	D <sub>3</sub>	277.2766	Do.	Geol. Bastrop	111.9966
Do.	E <sub>3</sub>	277.4997	Do.	377 Bastrop	113.2446
Wheatville, Minn.	F <sub>3</sub>	275.9300	Do.	S <sub>3</sub>	113.3906
Ada, Minn.	G <sub>3</sub>	277.0853	Near Bastrop, Tex.	T <sub>3</sub>	109.1584
Do.	U. S. G. S. Mer. Mark	276.2062	Hills Prairie, Tex.	359 Hills Prairie	107.7452
Do.	H <sub>3</sub>	276.7232	Near Upton, Tex.	U <sub>3</sub>	101.8172
Do.	I <sub>3</sub>	276.2288	Upton, Tex.	349 Upton	104.7076
Hadler, Minn.	J <sub>3</sub>	274.9049	Near Upton, Tex.	V <sub>3</sub>	109.9573
Near Hadler, Minn.	K <sub>3</sub>	276.4417	Smithville, Tex.	329 Smithville	98.8645
Lockhart, Minn.	L <sub>3</sub>	272.4820	Do.	W <sub>3</sub>	100.6185
Beltrami, Minn.	M <sub>3</sub>	275.8724	Do.	X <sub>3</sub>	100.6527
Do.	N <sub>3</sub>	276.0750	Do.	Y <sub>3</sub>	99.5196
Near Beltrami, Minn.	O <sub>3</sub>	274.9824	Near Smithville, Tex.	433 S. A.	129.658
Russia, Minn.	P <sub>3</sub>	272.7702	Do.	460 S. A.	137.9305
Near Russia, Minn.	Q <sub>3</sub>	271.5923	Do.	Z <sub>3</sub>	150.5013
Kittson, Minn.	R <sub>3</sub>	269.8344	Rosanky, Tex.	512 S. A.	153.7224
Near Kittson, Minn.	S <sub>3</sub>	268.7169	Near Hemkens, Tex.	451 S. A.	134.9441
Do.	T <sub>3</sub>	268.4563	Do.	T. B. M. 117	136.0403
Crookston, Minn.	U <sub>3</sub>	265.3942	Do.	A <sub>3</sub>	135.9465
Do.	V <sub>3</sub>	266.7096	Redrock, Tex.	491 S. A.	147.1423
Do.	City	264.9565	Bateman, Tex.	B <sub>3</sub>	144.0214
Do.	W <sub>3</sub>	272.0622	Near Dale, Tex.	C <sub>3</sub>	152.4206
Near Crookston, Minn.	X <sub>3</sub>	272.1557	Near Lockhart, Tex.	D <sub>3</sub>	130.7846
Shirley, Minn.	Y <sub>3</sub>	275.6594	Lockhart, Tex.	Geol. Lockhart	153.8273
Near Shirley, Minn.	Z <sub>3</sub>	275.7315	Do.	E <sub>3</sub>	160.2476
Near Euclid, Minn.	A <sub>3</sub>	274.3243	Do.	F <sub>3</sub>	159.7400
Euclid, Minn.	B <sub>3</sub>	272.0873	Near Lockhart, Tex.	G <sub>3</sub>	162.8245
Near Euclid, Minn.	C <sub>3</sub>	270.9351	Near Clear Fork, Tex.	Geol. Clear Fork	173.6528
Near Angus, Minn.	D <sub>3</sub>	262.5229	Maxwell, Tex.	Geol. Maxwell	184.0672
Angus, Minn.	E <sub>3</sub>	266.1345	Near Maxwell, Tex.	H <sub>3</sub>	177.6737
Near Angus, Minn.	F <sub>3</sub>	265.3760	Near Reedville, Tex.	100 S. A.	177.0644
Warren, Minn.	G <sub>3</sub>	260.7499	San Marcos, Tex.	I <sub>3</sub>	178.3273
Do.	H <sub>3</sub>	261.7317	Do.	J <sub>3</sub>	188.5889
Do.	I <sub>3</sub>	261.5647	Do.	K <sub>3</sub>	189.9618
Do.	J <sub>3</sub>	261.8240	Near San Marcos, Tex.	585 San Marcos	176.0631
Near Warren, Minn.	K <sub>3</sub>	260.5462	Near Hunter, Tex.	L <sub>3</sub>	205.0700
Near Argyle, Minn.	L <sub>3</sub>	258.6803	Do.	627 Yorks	189.4730
Argyle, Minn.	M <sub>3</sub>	258.2667	Do.	M <sub>3</sub>	197.7876
Do.	N <sub>3</sub>	259.6025	Goodwin, Tex.	N <sub>3</sub>	210.4307
Near Argyle, Minn.	O <sub>3</sub>	260.3312	Do.	695 S. A.	210.3561
Near Stephen, Minn.	P <sub>3</sub>	255.6188	Near New Braunfels, Tex.	T <sub>3</sub>	187.7330
Stephen, Minn.	Q <sub>3</sub>	253.7535	Do.	Seguin West Base	189.0932
Do.	R <sub>3</sub>	253.8405	Near Seguin, Tex.	Seguin East Base	181.8735
Do.	S <sub>3</sub>	253.1444	Near New Braunfels, Tex.	O <sub>3</sub>	190.2783
Near Stephen, Minn.	T <sub>3</sub>	253.7128	Do.	638 Comal	193.0182
Do.	Stephen West Base	253.6015	New Braunfels, Tex.	P <sub>3</sub>	194.6696
Near Holland, Tex.	W <sub>3</sub>	154.6978	Do.	Q <sub>3</sub>	193.6122
			Do.	R <sub>3</sub>	192.1704

\* This elevation supersedes the one given for Z<sub>4</sub> on p. 575, Appendix 3 of 1903.

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
New Braunfels, Tex.	S <sub>6</sub>	193.1736	Galveston, Tex.	G <sub>1</sub>	2.3759
Primms Spur, Tex.	316 Primms Spur	94.6801	Do.	Tidal 19.	2.9399
Near Kirtley, Tex.	U <sub>1</sub>	94.9769	Do.	Tidal 18.	1.7329
West Point, Tex.	292 West Point	87.3500	Do.	Tidal 17.	2.5760
Do.	V <sub>1</sub>	90.3113	Do.	City.	3.0974
Plum, Tex.	W <sub>1</sub>	91.3115	Do.	Tidal 16.	1.8819
Do.	X <sub>1</sub>	91.2747	Do.	Tidal 15.	1.9533
Near LaGrange, Tex.	Y <sub>1</sub>	86.1196	Do.	Tidal 14.	1.9243
LaGrange, Tex.	Z <sub>1</sub>	82.1858	Do.	Tidal 13.	2.3792
Do.	A <sub>1</sub>	82.0327	Do.	Tidal 12.	2.6058
Do.	B <sub>1</sub>	83.6036	Do.	Tidal 11.	2.4901
Near Halsted, Tex.	C <sub>1</sub>	99.3777	Do.	Tidal 10.	2.6146
Halsted, Tex.	D <sub>1</sub>	94.0521	Do.	Tidal 9.	0.9647
Fayetteville, Tex.	E <sub>1</sub>	127.2441	Do.	Tidal 8.	2.4514
Do.	F <sub>1</sub>	120.0845	Do.	Tidal 7.	2.2995
Boggytank, Tex.	G <sub>1</sub>	82.6288	Do.	Tidal 6.	1.6284
Near New Ulm, Tex.	H <sub>1</sub>	109.4284	Do.	Tidal 5.	2.6020
Near Ulm, Tex.	I <sub>1</sub>	122.5523	Do.	Tidal 4.	2.5762
Do.	J <sub>1</sub>	119.9013	Do.	Tidal 3.	2.4102
Near New Ulm, Tex.	K <sub>1</sub>	110.1808	Do.	Tidal 2.	1.0421
Cat Spring, Tex.	L <sub>1</sub>	92.5741	Grafton, Ill.	P. B. M. 4.	*135.9522
Near Sealy, Tex.	M <sub>1</sub>	69.0425	Do.	P. B. M. 3†	133.1752
Do.	N <sub>1</sub>	66.5994	Near Grafton, Ill.	P. B. M. 2.	130.2628
Sealy, Tex.	O <sub>1</sub>	62.0418	Do.	T. B. M. 2.	132.9859
Do.	P <sub>1</sub>	62.2359	Do.	P. B. M. 1.	136.4935
Do.	Q <sub>1</sub>	61.0699	Do.	Top of cap over same	137.7141
Near San Felipe, Tex.	R <sub>1</sub>	45.0549	Near Rosedale, Ill.	T. B. M. 8.	134.1096
Near McDowell, Tex.	S <sub>1</sub>	37.9507	Do.	T. B. M. 9.	134.2897
Near Brookshire, Tex.	T <sub>1</sub>	36.9010	Do.	P. B. M. 2.	138.5584
Brookshire, Tex.	U <sub>1</sub>	49.5176	Do.	T. B. M. 10.	136.2799
Near Brookshire, Tex.	V <sub>1</sub>	47.9885	Do.	P. B. M. 3.	132.0087
Near Katy, Tex.	W <sub>1</sub>	43.8077	Do.	Top of cap over same	133.2205
Katy, Tex.	X <sub>1</sub>	43.0817	Near Nutwood, Ill.	P. B. M. 4.	132.0360
Do.	Y <sub>1</sub>	43.4266	Nutwood, Ill.	P. B. M. 5.	132.2318
Near Katy, Tex.	Z <sub>1</sub>	40.8864	Do.	Top of cap over same	133.4504
Burnap, Tex.	A <sub>1</sub>	38.0406	Near Spankey, Ill.	P. B. M. 6.	129.3223
Barker, Tex.	B <sub>1</sub>	32.1458	Do.	Top of cap over same	129.5355
Lettia, Tex.	C <sub>1</sub>	29.3595	Spankey, Ill.	P. B. M. 7.	134.3029
Near Hillendahl, Tex.	D <sub>1</sub>	27.4006	Do.	Top of cap over same	135.5163
Do.	E <sub>1</sub>	26.5371	Near Spankey, Ill.	T. B. M. 27.	136.3033
Do.	F <sub>1</sub>	23.9641	Do.	P. B. M. 8.	130.9317
Do.	G <sub>1</sub>	21.8916	Do.	Top of cap over same	132.1443
Eureka, Tex.	H <sub>1</sub>	20.9059	Eldred, Ill.	P. B. M. 9.	137.0238
Houston Heights, Tex.	I <sub>1</sub>	18.5959	Do.	Top of cap over same	138.2330
Houston, Tex.	J <sub>1</sub>	13.7156	Near Eldred, Ill.	P. B. M. 10.	142.4517
Do.	K <sub>1</sub>	12.9079	Do.	Top of cap over same	143.6567
Do.	L <sub>1</sub>	13.2866	Near Bridgewater, Ill.	P. B. M. 11.	144.4740
Do.	City.	13.9533	Do.	Top of cap over same	145.6845
Near Houston, Tex.	M <sub>1</sub>	13.2077	Do.	P. B. M. 12.	131.9924
Near Harrisburg, Tex.	N <sub>1</sub>	7.1178	Do.	Top of cap over same	133.2044
Harrisburg, Tex.	R. M.	11.6028	Pegram, Ill.	P. B. M. 13.	131.5364
Near Harrisburg, Tex.	O <sub>1</sub>	11.4289	Do.	Top of cap over same	132.7427
Do.	M. M. 9.	10.7605	Near Hillview, Ill.	P. B. M. 14.	133.0113
Do.	P <sub>1</sub>	11.6084	Do.	Top of cap over same	134.2103
Near Genoa, Tex.	Q <sub>1</sub>	11.3402	Do.	P. B. M. 15.	143.8471
Do.	M. M. 12.	12.5883	Do.	Top of cap over same	145.0579
Genoa, Tex.	R <sub>1</sub>	15.1913	Near Glasgow, Ill.	P. B. M. 16.	134.6624
Do.	S <sub>1</sub>	14.3362	Do.	Top of cap over same	135.8605
Near Genoa, Tex.	M. M. 16.	13.2793	Near Bloomfield, Ill.	P. B. M. 17.	135.0193
Do.	M. M. 18.	9.4980	Do.	Top of cap over same	136.2173
Near Webster, Tex.	T <sub>1</sub>	9.6015	Do.	P. B. M. 18.	133.6620
Webster, Tex.	U <sub>1</sub>	8.1982	Do.	Top of cap over same	134.5709
Near Webster, Tex.	M. M. 22.	8.2109	Near Oxville, Ill.	P. B. M. 19.	136.0025
League City, Tex.	V <sub>1</sub>	7.1761	Do.	Top of cap over same	137.2071
Near League City, Tex.	W <sub>1</sub>	6.9942	Bluffs, Ill.	P. B. M. 20.	142.3029
Near Dickinson, Tex.	X <sub>1</sub>	6.4925	Do.	Top of cap over same	143.5046
Dickinson, Tex.	Y <sub>1</sub>	5.6777	Near Bluffs, Ill.	P. B. M. 21.	147.8821
Near Dickinson, Tex.	Z <sub>1</sub>	5.8928	Do.	Top of cap over same	149.0766
Near Lamarque, Tex.	M. M. 32.	6.3555	Near Meredosia, Ill.	P. B. M. 22.	146.3218
Do.	M. M. 34.	5.4844	Do.	Top of cap over same	146.5187
Lamarque, Tex.	A <sub>1</sub>	5.6734	Near Lydda, Ill.	P. B. M. 23.	137.1482
Do.	B <sub>1</sub>	5.2743	Do.	Top of cap over same	138.3444
Texas City Jct., Tex.	C <sub>1</sub>	2.5847	Near Beardstown, Ill.	P. B. M. 24.	138.2827
Near Texas City Jct., Tex.	M. M. 41.	1.3186	Do.	Top of cap over same	139.4781
Virginia Point, Tex.	D <sub>1</sub>	1.4966	Do.	P. B. M. 25.	134.0728
Near Galveston, Tex.	E <sub>1</sub>	0.7412	Do.	Top of cap over same	135.2794
Galveston, Tex.	F <sub>1</sub>	2.0281	Beardstown, Ill.	B. M.	136.0080

\* This elevation supersedes that on page 480 of Report for 1903, determined by the leveling in 1880, it being assumed that the discrepancy, 17.5 millimeters, between this elevation and that determined by the leveling in 1902, indicates that the bench mark has changed in elevation.

† In new position, see description.

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Beardstown, Ill.	P. B. M. 26.	135.4386	Near Spariland, Ill.	T. B. M. 291.	141.4846
Do.	P. B. M. 27.	135.2723	Spariland, Ill.	P. B. M. 63.	138.9064
Near Beardstown, Ill.	P. B. M. 28.	135.8628	Do.	Top of cap over same.	140.1121
Do.	Top of cap over same.	137.0631	Near Spariland, Ill.	T. B. M. 293.	138.5755
Do.	P. B. M. 29.	144.4765	Do.	P. B. M. 64.	143.4839
Near Chandlerlerville, Ill.	Top of cap over same.	145.6817	Near Henry, Ill.	Top of cap over same.	144.6879
Do.	P. B. M. 30.	147.6931	Do.	T. B. M. 297.	142.1146
Chandlerlerville, Ill.	Top of cap over same.	148.8639	Do.	T. B. M. 299.	148.6153
Do.	P. B. M. 31.	140.1511	Do.	P. B. M. 65.	148.4899
Saidora, Ill.	Top of cap over same.	141.3522	Do.	Top of cap over same.	148.6906
Do.	P. B. M. 32.	143.8539	Do.	T. B. M. 303.	158.7687
Bath, Ill.	Top of cap over same.	145.0348	Do.	T. B. M. 304.	159.2177
Do.	P. B. M. 33.	139.7424	Near Putnam, Ill.	P. B. M. 66.	157.6913
Do.	Top of cap over same.	140.9455	Putnam, Ill.	Top of cap over same.	158.8882
Matanzas, Ill.	P. B. M. 34.	141.8823	Do.	P. B. M. 67.	159.3538
Do.	P. B. M. 35.	140.4986	Near Putnam, Ill.	Top of cap over same.	160.5647
Near Havana, Ill.	Top of cap over same.	141.7008	Do.	P. B. M. 68.	143.7945
Do.	P. B. M. 36.	144.3552	Near Bureau, Ill.	Top of cap over same.	146.9334
Havana, Ill.	Top of cap over same.	145.5592	Do.	T. B. M. 314.	141.0816
Do.	P. B. M. 37.	137.5747	Do.	T. B. M. 317.	143.0461
Do.	P. B. M. 38.	143.5418	Do.	P. B. M. 69.	139.8565
Do.	P. B. M. 39.	144.5743	Do.	Top of cap over same.	141.6592
Do.	P. B. M. 40.	143.4530	Bureau, Ill.	T. B. M. 319.	143.9836
Near Havana, Ill.	P. B. M. 41.	142.3908	Near Bureau, Ill.	T. B. M. 321.	142.9990
Do.	Top of cap over same.	143.5863	Do.	P. B. M. 70.	143.0551
Do.	T. B. M. 186.	135.8212	Do.	Top of cap over same.	144.8052
Near Liverpool, Ill.	P. B. M. 42.	146.6974	Near Depue, Ill.	T. B. M. 324.	142.6081
Do.	Top of cap over same.	147.8991	Do.	P. B. M. 71.	145.3980
Near Topeka, Ill.	P. B. M. 43.	150.6061	Do.	Top of cap over same.	146.6040
Do.	Top of cap over same.	151.8089	Near Marquette, Ill.	T. B. M. 328.	141.4142
Near Manito, Ill.	P. B. M. 44.	156.2089	Do.	R. R. B. M.	141.3653
Do.	Top of cap over same.	157.4178	Do.	T. B. M. 330.	140.8135
Near Marshalls Landing, Ill.	P. B. M. 45.	155.6521	Near Spring Valley, Ill.	T. B. M. 332.	140.9912
Do.	Top of cap over same.	156.8572	Do.	P. B. M. 72.	142.5003
Do.	P. B. M. 46.	155.0592	Do.	Top of cap over same.	143.7047
Near Gales Landing, Ill.	Top of cap over same.	156.2642	Do.	T. B. M. 333.	141.2180
Do.	P. B. M. 47.	139.9446	Spring Valley, Ill.	P. B. M. 73.	140.9106
Near Stoehrs, Ill.	Top of cap over same.	138.1551	Do.	Sanitary B. M.	141.7146
Do.	T. B. M. 228.	138.4727	Near Spring Valley, Ill.	T. B. M. 335.	140.9868
Do.	U. S. G. S.	138.4740	Do.	P. B. M. 74.	139.7934
Near Pekin, Ill.	P. B. M. 48.	142.5874	Do.	Top of cap over same.	140.9966
Do.	Top of cap over same.	143.7883	Near Peru, Ill.	T. B. M. 336.	141.5737
Do.	T. B. M. 235.	141.0337	Do.	T. B. M. 337.	141.3646
Pekin, Ill.	T. B. M. 237.	137.5223	Peru, Ill.	T. B. M. 338.	143.5977
Do.	P. B. M. 49.	138.8128	Do.	P. B. M. 75.	139.8896
Do.	T. B. M. 238.	141.1553	Near Peru, Ill.	Sanitary B. M.	139.8868
Near Pekin, Ill.	T. B. M. 239.	142.0313	Do.	B. M. 70 A (Seddon).	136.6894
Do.	T. B. M. 240.	141.0924	Do.	B. M. 38 (1883).	136.6726
Do.	P. B. M. 50.	140.6301	Do.	P. B. M. 76.	142.6831
Do.	Top of cap over same.	141.8343	Do.	T. B. M. 340.	140.5889
Do.	P. B. M. 51.	136.2923	Do.	Sanitary B. M.	140.6819
Wesley, Ill.	Top of cap over same.	137.5003	Do.	P. B. M. 77.	148.6908
Wesley Junction, Ill.	T. B. M. 249.	138.3868	Near LaSalle, Ill.	T. B. M. 343.	136.8530
Peoria, Ill.	P. B. M. 52.	139.1582	Do.	P. B. M. 78.	137.5933
Do.	T. B. M. 250.	139.0967	Near Utica, Ill.	Top of cap over same.	138.7989
Do.	T. B. M. 251.	138.9106	Do.	T. B. M. 347.	138.5762
Do.	T. B. M. 253.	139.8473	Do.	B. M. 69 (Seddon).	138.5791
Do.	B. M.	139.8490	Do.	U. S. B. M.	141.7511
Do.	P. B. M. 53.	137.9508	Do.	P. B. M. 79.	141.7222
Do.	P. B. M. 54.	138.9037	Do.	T. B. M. 348.	137.4346
Do.	T. B. M. 254.	143.3433	Do.	T. B. M. 349.	136.8711
Averyville, Ill.	T. B. M. 256.	143.6837	Do.	P. B. M. 80.	141.0179
Near Peoria, Ill.	T. B. M. 257.	139.5204	Do.	Top of cap over same.	142.2225
Do.	P. B. M. 55.	138.2439	Near Ottawa, Ill.	P. B. M. 81.	145.5147
Do.	Top of cap over same.	139.4523	Do.	P. B. M. 82.	140.8405
Do.	B. M. 11.	138.1470	Do.	Top of cap over same.	142.0450
Do.	T. B. M. 258.	141.6271	Do.	T. B. M. 357.	147.9006
Do.	P. B. M. 56.	144.1729	Ottawa, Ill.	B. M. 64 (Seddon).	145.3596
Do.	Top of cap over same.	145.3832	Do.	P. B. M. 83.	144.4281
Mossville, Ill.	P. B. M. 57.	142.6524	Do.	B. M. 63 (Seddon).	146.3487
Do.	Top of cap over same.	143.8536	Do.	T. B. M. 361.	147.4219
Near Mossville, Ill.	P. B. M. 58.	139.9234	Do.	P. B. M. 84.	144.4884
Do.	Top of cap over same.	141.1258	Near Ottawa, Ill.	T. B. M. 363.	150.1217
Rome, Ill.	P. B. M. 59.	140.6579	Do.	B. M. 62 (Seddon).	150.1328
Do.	Top of cap over same.	141.8532	Do.	T. B. M. 366.	147.4733
Chillicothe, Ill.	P. B. M. 60.	148.1023	Do.	P. B. M. 85.	147.5865
Do.	Top of cap over same.	149.3137	Do.	Top of cap over same.	148.7819
Near Chillicothe, Ill.	T. B. M. 283.	146.9981	Marselles, Ill.	T. B. M. 371.	149.9408
Do.	P. B. M. 61.	145.8575	Do.	P. B. M. 86.	146.8840
Do.	P. B. M. 62.	140.1130	Do.	B. M. 59 (Seddon).	149.4246
Do.	Top of cap over same.	141.3699	Do.	P. B. M. 87.	151.5545

*Corrected elevations of permanent bench marks—Continued.*

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
<i>meters.</i>			<i>meters.</i>		
Marseilles, Ill.	B. M. (Ward 1902).....	154.0928	Near Romeo, Ill.	P. B. M. 112.....	177.7561
Near Marseilles, Ill.	(P. B. M. 88).....	152.9222	Romeo, Ill.	S. D. 94.....	179.6062
Do.	Top of cap over same.....	154.1285	Do.	P. B. M. 113.....	181.5080
Do.	B. M. 10 (Ward 1899).....	152.4100	Do.	S. D. 93.....	181.0927
Near Seneca, Ill.	T. B. M. 378.....	162.6247	Do.	Sanitary B. M.....	179.7008
Do.	B. M. 15 (Ward 1899).....	152.4145	Near Romeo, Ill.	T. B. M. 445.....	177.7442
Do.	T. B. M. 380.....	156.0315	Do.	T. B. M. 446.....	177.6415
Do.	(P. B. M. 89).....	154.5232	Do.	T. B. M. 447.....	177.8675
Do.	Top of cap over same.....	155.7312	Near Lemont, Ill.	T. B. M. 449.....	178.2841
Do.	(P. B. M. 90).....	154.6324	Do.	T. B. M. 450.....	178.2422
Do.	Top of cap over same.....	155.8423	Lemont, Ill.	T. B. M. 451.....	179.6311
Near Morris, Ill.	(P. B. M. 91).....	154.7022	Do.	P. B. M. 114.....	181.0630
Do.	Top of cap over same.....	155.9594	Do.	P. B. M. 115.....	179.8659
Morris, Ill.	T. B. M. 394.....	153.9917	Do.	S. D. 88.....	184.5338
Do.	T. B. M. 395.....	154.9037	Do.	S. D. 80.....	184.1760
Do.	P. B. M. 92.....	153.6376	Do.	S. D. 79.....	179.1250
Do.	B. M. 45 A (Seddon).....	155.0646	Near Lemont, Ill.	T. B. M. 452.....	178.3717
Do.	B. M. 45 B (Seddon).....	148.5383	Do.	P. B. M. 116.....	178.2882
Near Morris, Ill.	T. B. M. 398.....	154.2407	Do.	T. B. M. 453.....	178.3358
Do.	T. B. M. 400.....	155.0392	Do.	P. B. M. 117.....	178.3119
Do.	(P. B. M. 93).....	151.8963	Do.	Lower Sanitary B. M.....	178.3216
Do.	Top of cap over same.....	153.1036	Do.	Upper Sanitary B. M.....	178.3034
Do.	T. B. M. 402.....	152.9762	Do.	T. B. M. 454.....	178.3024
Do.	P. B. M. 94.....	156.3108	Sag Bridge Station, Ill.	T. B. M. 455.....	178.2921
Do.	B. M. 39 (Seddon).....	156.3184	Near Willow Springs, Ill.	T. B. M. 456.....	178.3027
Do.	(P. B. M. 95).....	154.7652	Do.	P. B. M. 118.....	178.2510
Do.	Top of cap over same.....	155.9724	Do.	S. D. 62.....	179.7932
Do.	T. B. M. 404.....	152.7860	Do.	S. D. 63.....	180.6177
Near Channahon, Ill.	T. B. M. 405.....	155.3732	Do.	S. D. 64.....	180.1886
Do.	B. M. 38 A (Seddon).....	159.3098	Do.	T. B. M. 457.....	178.3370
Do.	(P. B. M. 96).....	160.0422	Do.	T. B. M. 458.....	178.3161
Do.	Top of cap over same.....	161.2488	Do.	P. B. M. 119.....	178.4133
Channahon	P. B. M. 97.....	159.1497	Willow Springs, Ill.	T. B. M. 459.....	181.3619
Do.	B. M.....	159.1539	Do.	Sanitary B. M.....	178.7904
Near Channahon, Ill.	(P. B. M. 98).....	160.0814	Do.	S. D. 54.....	184.4835
Do.	Top of cap over same.....	161.2868	Do.	S. D. 51.....	182.3233
Do.	S. D. 144.....	164.4824	Do.	S. D. 50.....	182.4229
Do.	S. D. 143.....	165.0698	Do.	P. B. M. 120.....	180.4847
Do.	(P. B. M. 99).....	157.4469	Do.	P. B. M. 121.....	187.9104
Do.	Top of cap over same.....	158.6495	Do.	S. D. 57.....	186.4065
Millsdale, Ill.	B. M. 25 A (Seddon).....	155.3657	Mount Forest, Ill.	T. B. M. 460.....	180.7937
Do.	S. D. 141.....	174.3569	Do.	S. D. 49.....	180.2376
Near Joliet, Ill.	T. B. M. 424.....	155.9318	Do.	S. D. 48.....	180.7802
Do.	(P. B. M. 100).....	158.5317	Near Mount Forest, Ill.	T. B. M. 461.....	181.2957
Do.	Top of cap over same.....	159.7356	Do.	T. B. M. 462.....	180.9313
Do.	T. B. M. 427.....	159.3386	Near Summit, Ill.	T. B. M. 463.....	181.0157
Near Rockdale, Ill.	T. B. M. 429.....	161.2531	Do.	T. B. M. 464.....	181.0128
Do.	S. D. 135.....	159.4739	Do.	T. B. M. 465.....	180.8106
Do.	(P. B. M. 101).....	159.2185	Do.	P. B. M. 122.....	181.3025
Rockdale, Ill.	Top of cap over same.....	160.4217	Do.	S. D. 40.....	180.9226
Do.	S. D. 130.....	162.0629	Do.	S. D. 39.....	183.7225
Near Rockdale, Ill.	P. B. M. 102.....	158.3267	Do.	Sanitary B. M.....	183.0357
Joliet, Ill.	T. B. M. 432.....	166.3351	Do.	(P. B. M. 123).....	186.3142
Do.	T. B. M. 433.....	164.9558	Do.	Top of cap over same.....	187.5181
Do.	P. B. M. 103.....	164.0242	Do.	Chicago West Base.....	187.8580
Do.	S. D. 127.....	166.1726	Summit, Ill.	T. B. M. 466.....	180.5548
Do.	T. B. M. 434.....	165.8486	Do.	P. B. M. 124.....	182.7648
Do.	T. B. M. 435.....	167.5199	Do.	Sanitary B. M.....	182.7692
Do.	P. B. M. 104.....	167.3322	Near Summit, Ill.	T. B. M. 468.....	181.5502
Do.	T. B. M. 436.....	166.0990	Do.	P. B. M. 125.....	181.3899
Do.	P. B. M. 105.....	167.0449	Do.	P. B. M. 126.....	183.1870
Near Joliet, Ill.	P. B. M. 106.....	168.8601	Do.	Top of cap over same.....	184.3942
Do.	S. D. 117.....	170.5323	Near Chicago, Ill.	S. D. 22.....	181.0186
Do.	T. B. M. 437.....	170.7634	Do.	T. B. M. 470.....	180.6430
Near Lockport, Ill.	T. B. M. 438.....	173.5792	Do.	T. B. M. 471.....	180.7034
Do.	S. D. 109.....	173.5846	Chicago, Ill.	T. B. M. 472.....	180.0247
Lockport, Ill.	S. D. 107.....	177.2503	Do.	P. B. M. 127.....	183.3167
Do.	S. D. 106.....	177.2604	Do.	S. D. 24.....	180.6056
Do.	P. B. M. 107.....	174.7410	Do.	S. D. 18.....	182.5342
Do.	P. B. M. 108.....	174.9738	Do.	(P. B. M. 128).....	180.9093
Do.	S. D. 116.....	183.5422	Do.	Top of cap over same.....	182.1180
Do.	S. D. 114.....	178.3489	Do.	T. B. M. 474.....	180.5970
Do.	T. B. M. 440.....	171.9360	Do.	P. B. M. 129.....	182.6259
Do.	P. B. M. 109.....	171.9422	Do.	Sanitary B. M.....	183.0966
Do.	P. B. M. 110.....	173.3906	Do.	S. D. 16.....	182.9816
Do.	P. B. M. 111.....	175.1374	Do.	S. D. 15.....	182.2059
Near Lockport, Ill.	T. B. M. 441.....	178.3070	Do.	S. D. 14.....	181.7463
Do.	Sanitary B. M.....	178.3120	Do.	T. B. M. 475.....	181.8991
Do.	T. B. M. 442.....	178.3015	Do.	P. B. M. 130.....	182.9993
Near Romeo, Ill.	T. B. M. 443.....	178.2903	Do.	Sanitary B. M.....	183.9082
Do.	T. B. M. 444.....	177.6382	Do.	P. B. M. 131.....	181.5696



## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Chicago, Ill.	South Sanitary B. M.	183.8440	Rosehill, Ill.	K.	172.7105
Do.	North Sanitary B. M.	183.8354	Near Hidalgo, Ill.	L.	177.4782
Do.	T. B. M. 476	179.8767	Do.	M.	180.9420
Do.	T. B. M. 477	180.8609	Greenup, Ill.	N.	165.7170
Do.	T. B. M. 478	180.8863	Near Greenup, Ill.	O.	168.6727
Do.	P. B. M. 132	182.0289	Near Toledo, Ill.	P.	183.7533
Do.	P. B. M. 133	181.6163	Near Bradbury, Ill.	Q.	185.3588
Do.	P. B. M. 134	181.4956	Do.	R.	206.2227
Do.	West Sanitary B. M.	183.0029	Near Janesville, Ill.	S.	224.3143
Do.	East Sanitary B. M.	182.9907	Lerna, Ill.	T.	229.9159
Do.	T. B. M. 479	181.7285	Near Lerna, Ill.	U.	215.9784
Do.	S. D. 9	180.6568	Do.	V.	187.6203
Do.	T. B. M. 480	179.0411	Charleston, Ill.	W.	205.0712
Do.	P. B. M. 135	179.4587	Do.	X.	206.2567
Do.	S. D. 7	180.3748	Near Charleston, Ill.	Y.	206.3573
Do.	S. D. 6	180.3528	Near Fairgrange, Ill.	Z.	206.4232
Do.	S. D. 2	178.3044	Near Bushon, Ill.	A.	203.1757
Do.	S. D. 1	179.6410	Near Rardin, Ill.	B.	200.6649
Do.	T. B. M. 481	179.9515	Near Oakland, Ill.	C.	199.0415
Do.	T. B. M. 482	180.3937	Do.	D.	201.6540
Do.	T. B. M. 483	179.2134	Do.	E.	201.8336
Do.	P. B. M. 136	180.9170	Near Brockton, Ill.	F.	206.8565
Do.	T. B. M. 484	181.1160	Do.	G.	200.0299
Do.	City 7	180.8447	Near Hume, Ill.	H.	196.9923
Do.	T. B. M. 485	181.1094	Do.	I.	211.4012
Do.	P. B. M. 137	180.7994	Near Hildreth, Ill.	J.	210.9172
Do.	P. B. M. 138	181.1337	Sidell, Ill.	K.	208.8446
Do.	P. B. M. 139	181.1710	Near Sidell, Ill.	L.	207.2215
Do.	T. B. M. 486	179.8925	Jamaica, Ill.	M.	206.6282
Do.	T. B. M. 488	180.9821	Near Jamaica, Ill.	N.	203.7146
Do.	P. B. M. 98	182.4168	Near Fairmount Jet., Ill.	O.	199.4987
Do.	City 9	180.7004	Do.	P.	204.9415
Do.	B. M. VII	181.5406	Near Catlin, Ill.	Q.	200.3747
Do.	B. M. VI	181.4441	Near Fairmount, Ill.	R.	198.9056
Do.	P. B. M. 96	182.3750	Do.	S.	202.5072
			Near Homer, Ill.	T.	205.5832
			Do.	U.	208.6152
Pekin, Ill.	A—City	146.0275	Sidney, Ill.	V.	208.0012
Do.	B	146.0240	Deers, Ill.	W.	210.9080
Near Leslie, Ill.	D	207.8677	Mira, Ill.	X.	212.1671
Tremont, Ill.	E	196.1162	Near Urbana, Ill.	Y.	214.7748
Near Menart, Ill.	F	175.4537			
Do.	G	177.7395			
Mackinaw, Ill.	H	196.9740	Near Renick, Ohio	A	187.9645
Lilly, Ill.	I	244.8366	Near Locks, Ohio	B	185.9376
Woodruff, Ill.	J	256.0928	Do.	C	179.5925
Danvers, Ill.	K	246.6656	Near Higby, Ohio	D	179.4469
Near Twin Grove, Ill.	L	230.1085	Omega, Ohio	E	181.5502
Twin Grove, Ill.	M	248.8453	Near Omega, Ohio	F	174.0515
Near Bloomington, Ill.	N	227.4674	Near Waverly, Ohio	G	173.6827
Do.	O	241.9962	Near Glen Jean, Ohio	H	171.2458
Bloomington, Ill.	P	252.9234	Piketon, Ohio	I	176.2580
Near Gillum, Ill.	Q	253.8490	Near Sargents, Ohio	J	176.6795
Gillum, Ill.	R	250.0634	Near Wakefield, Ohio	K	167.9240
Downs, Ill.	S	242.0944	Clifford, Ohio	L	169.4931
Near Ford Woods, Ill.	T	241.2006	Near Lucasville, Ohio	M	168.8804
Le Roy, Ill.	U	237.7148	Near Davis, Ohio	N	170.3096
Empire, Ill.	V	230.3011	Do.	O	170.0387
Near Farmer City, Ill.	W	222.7233	Near Vera, Ohio	P	162.6795
Farmer City, Ill.	X	223.2694	Portsmouth, Ohio	U. S. E.	163.1077
Harris, Ill.	Y	219.9542			
Mansfield, Ill.	Z	221.6778			
Near Mahomet, Ill.	A.	219.9633	Chillicothe, Ohio	A	196.0462
Mahomet, Ill.	B.	217.0538	Near Chillicothe, Ohio	C	199.0700
Near Mahomet, Ill.	C.	223.5805	Delano, Ohio	D	210.8417
Rising, Ill.	D.	223.7518	Do.	E	211.5171
Near Champaign, Ill.	E.	228.0904	Kingston, Ohio	F	235.9364
Champaign, Ill.	F.	219.7925	Near Kingston, Ohio	G	227.5680
Do.	G.	220.3019	Near Haysville, Ohio	H	217.5228
			Near Circleville, Ohio	I.	215.3522
Olney, Ill.	A.	147.4152	Do.	J.	210.3716
Near Olney, Ill.	B.	141.8934	Circleville, Ohio	K	211.3999
Do.	C.	144.8742	Near Circleville, Ohio	L	211.2889
Near Dundas, Ill.	D.	146.6981	Near Cromley, Ohio	M	216.2930
Near W. Liberty, Ill.	E.	146.6863	Duvals, Ohio	N	217.0480
Do.	F.	154.5730	Near Duvals, Ohio	O	218.2004
Near Boos, Ill.	G.	160.0864	Lockbourne, Ohio	P	218.1212
Near Newton, Ill.	H.	156.3593	Near Rees, Ohio	Q	220.3305
Do.	I.	164.2284	Near Valley Crossing, Ohio	R	229.1899
Near Falmouth, Ill.	J.	172.1758	Columbus, Ohio	T.	237.0133
			Do.	S—City	237.8663

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Bannon, Ohio.....	A.....	229.3569	Near Annapolis Jct., Md.....	B. & O. 22.....	53.1999
Near Truro, Ohio.....	T. B. M. 6.....	233.8908	Near Bridewell, Md.....	B. & O. 23.....	51.9240
Near Brice, Ohio.....	T. B. M. 9.....	243.1568	Do.....	B. & O. 24.....	51.4110
Near Harley, Ohio.....	C.....	263.6536	Near Jessups, Md.....	B. & O. 25.....	45.2554
Basli, Ohio.....	D.....	264.3626	Near Montevideo, Md.....	B. & O. 26.....	41.7988
Thurston, Ohio.....	E.....	270.1689	Near Dorsey, Md.....	B. & O. 27.....	53.8816
Near Thurston, Ohio.....	F.....	285.0395	Near Harwood, Md.....	B. & P. 28.....	26.8881
Near New Salem, Ohio.....	G.....	290.1001	Near Hanover, Md.....	B. & O. 29.....	24.6441
Thornport, Ohio.....	H.....	274.2887	Near Elk Ridge, Md.....	B. & O. 30.....	21.6729
Near Thornport, Ohio.....	I.....	268.2445	Relay, Md.....	B. & O. 31.....	21.8587
Glenford, Ohio.....	J.....	258.8068	Near St. Denis, Md.....	B. & O. 31A.....	20.6323
Do.....	844 Glenford.....	257.4219	Do.....	B. & O. 32.....	22.5234
Near Glassrock, Ohio.....	K.....	251.7350	Near Hæthorpe, Md.....	B. & O. 33.....	20.6654
Mount Perry, Ohio.....	L.....	244.2975	Near Lansdowne, Md.....	P. R. R. 101.....	11.2065
Near Mount Perry, Ohio.....	M.....	248.1049	Lansdowne, Md.....	B. & O. 34.....	21.0103
Near Fultonham, Ohio.....	N.....	232.5432	Near Lansdowne, Md.....	B. & O. 35.....	24.1122
Near White Cottage, Ohio.....	O.....	218.5234	West Baltimore, Md.....	B. & O. 36.....	22.0631
Near South Zanesville, Ohio.....	P.....	216.2791	Baltimore, Md.....	B. & O. 39.....	2.7836
Zanesville, Ohio.....	Q.....	221.2002	Do.....	City 1288.....	38.7284
Do.....	725 Zanesville.....	221.1928	Do.....	B. & O. 41.....	21.6028
Do.....	U. S. E. 2.....	213.1470	Do.....	B. & O. 42.....	28.5625
Do.....	U. S. E. 1.....	213.0912	Do.....	B. & O. 43.....	45.5279
Near Zanesville, Ohio.....	R.....	237.2960	Do.....	City 1240.....	43.4021
Sonora, Ohio.....	S.....	246.4807	Baltimore, Md.....	Tidal 2.....	1.4098
Near Sonora, Ohio.....	T.....	237.3262	Do.....	Tidal 1.....	1.3540
Do.....	U.....	234.7580	Do.....	Tidal 3.....	2.7733
Sundale, Ohio.....	V.....	270.0852	Do.....	Tidal 4.....	8.3933
New Concord, Ohio.....	W.....	257.0399	Do.....	City 1181.....	9.3335
Near New Concord, Ohio.....	X.....	248.3994	Do.....	L.....	21.3121
Cassells, Ohio.....	Y.....	245.1188	Do.....	M.....	2.7411
Near Cassells, Ohio.....	Z.....	245.2147	Do.....	B. & O. 40.....	7.0634
Cambridge, Ohio.....	A.....	270.0313	Mount Winans, Md.....	B. & O. 38.....	6.5934
Near Cambridge, Ohio.....	B.....	245.2353	Do.....	B. & O. 37.....	11.2064
Do.....	C.....	238.9204	Near Relay, Md.....	B. & O. 100.....	20.3094
Do.....	D.....	239.9651	Vineyard, Md.....	B. & O. 101.....	21.6324
Kimbolton, Ohio.....	E.....	239.9685	Near Vineyard, Md.....	B. & O. 102.....	23.4969
Birds Run, Ohio.....	G.....	234.9817	Near Orange Grove, Md.....	B. & O. 103.....	28.9523
Guernsey, Ohio.....	H.....	237.9748	Ilchester, Md.....	B. & O. 104.....	33.2756
Near Guernsey, Ohio.....	I.....	252.5469	Gray, Md.....	B. & O. 105.....	37.0290
Newcomerstown, Ohio.....	J.....	245.4794	Ellicott City, Md.....	B. & O. 106.....	44.0050
Near Newcomerstown, Ohio.....	K.....	245.3391	Oella, Md.....	B. & O. 106A.....	45.1209
Near Port Washington, Ohio.....	P. R. R.....	249.3509	Near Oella, Md.....	B. & O. 107.....	51.3397
Do.....	L.....	249.3463	Near Hollifield, Md.....	B. & O. 108.....	57.1603
Seventeen, Ohio.....	M.....	254.5333	Do.....	U. S. G. S.....	57.1833
Gnadenbutten, Ohio.....	N.....	254.4396	Do.....	B. & O. 109.....	58.7116
Near Tuscarawas, Ohio.....	O.....	257.5486	Hollofield, Md.....	B. & O. 110.....	60.9590
Uhrichsville, Ohio.....	B. & O. 48.....	262.8218	Near Hollifield, Md.....	B. & O. 111.....	65.7494
Near Uhrichsville, Ohio.....	P.....	262.5847	Alberton, Md.....	B. & O. 112.....	67.7728
Near Dennison, Ohio.....	P. R. R.....	261.8257	Near Alberton, Md.....	B. & O. 113.....	72.2535
Station 15 P. O., Ohio.....	868 Steubenville.....	264.7564	Do.....	B. & O. 114.....	74.6226
Washington, D. C.....	B. & O. 1.....	12.8002	Near Davis, Md.....	B. & O. 115.....	76.0186
Do.....	B. & O. 2.....	17.7679	Davis, Md.....	B. & O. 116.....	78.8704
Near Winthrop Heights, D. C.....	B. & O. 3.....	20.6615	Near Woodstock, Md.....	B. & O. 117.....	82.7730
Langdon, D. C.....	B. & O. 4.....	20.8578	Do.....	B. & O. 118.....	87.8501
Rives, Md.....	B. & O. 5.....	18.2068	Near Marriottsville, Md.....	B. & O. 119.....	88.8796
Near Hyattsville, Md.....	B. & O. 6.....	10.5778	Marriottsville, Md.....	B. & O. 120.....	89.2582
Alexandria Junction, Md.....	B. & O. 7.....	14.9990	Near Henryton, Md.....	B. & O. 121.....	91.1842
Riverdale, Md.....	B. & O. 7A.....	15.8442	Near Gorsuch, Md.....	B. & O. 122.....	94.7764
Near Riverdale, Md.....	B. & O. 8.....	16.2173	Gorsuch, Md.....	B. & O. 123.....	98.6447
Near College Park, Md.....	B. & O. 9.....	16.1425	Near Sykesville, Md.....	B. & O. 124.....	107.0067
Near Berwyn, Md.....	B. & O. 9A.....	16.1656	Sykesville, Md.....	B. & O. 125.....	114.5875
Near Branchville, Md.....	B. & O. 10.....	20.0194	Near Galther, Md.....	B. & O. 126.....	124.5958
Do.....	B. & O. 11.....	23.6360	Do.....	B. & O. 127.....	127.7827
Near Sunnyside, Md.....	B. & O. 12.....	30.8858	Near Hoods Mills, Md.....	B. & O. 128.....	130.4845
Near Beltsville, Md.....	B. & O. 13.....	38.2334	Hoods Mills, Md.....	B. & O. 129.....	134.6720
Near Ammendale, Md.....	B. & O. 14.....	42.0134	Near Morgan, Md.....	B. & O. 130.....	140.4341
Near Muirkirk, Md.....	B. & O. 14A.....	46.5234	Near Woodbine, Md.....	B. & O. 131.....	148.1239
Do.....	B. & O. 15.....	48.0571	Woodbine, Md.....	B. & O. 131A.....	151.1419
Near Contee, Md.....	B. & O. 16.....	54.6419	Near Woodbine, Md.....	B. & O. 132.....	156.5861
Do.....	B. & O. 17.....	53.6209	Near Watersville, Md.....	B. & O. 133.....	167.7964
Near Oak Crest, Md.....	B. & O. 17A.....	51.7196	Do.....	B. & O. 134.....	180.9051
Near Laurel, Md.....	B. & O. 18.....	47.2798	Do.....	B. & O. 135.....	189.6044
Laurel, Md.....	B. & O. 19.....	45.4809	Do.....	B. & O. 136.....	214.3363
Near Savage Station, Md.....	B. & O. 20.....	52.6988	Do.....	B. & O. 136A.....	207.2420
Do.....	B. & O. 21.....	47.0313	Near Plane No. 4, Md.....	B. & O. 137.....	200.3558
			Do.....	B. & O. 138.....	177.1849
			Near Bartholows, Md.....	B. & O. 139.....	167.6890

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Bartholows, Md.	B. & O. 140.	161.0576	Near Sipes, Pa.	B. & O. 223.	393.0438
Near Monrovia, Md.	B. & O. 141.	140.1981	Do.	B. & O. 224.	384.2145
Do.	B. & O. 142.	144.3237	Near Ohlpylle, Pa.	B. & O. 225.	375.2805
Monrovia, Md.	B. & O. 143.	130.2274	Do.	B. & O. 226.	368.4744
Near Monrovia, Md.	B. & O. 144.	119.1845	Near Bear Run, Pa.	B. & O. 227.	358.8601
Do.	B. & O. 145.	114.9543	Bear Run, Pa.	B. & O. 228.	351.1495
Near Ijamsville, Md.	B. & O. 146.	109.7640	Near Bear Run, Pa.	B. & O. 229.	342.4036
Do.	B. & O. 147.	107.2666	Near Stewarton, Pa.	B. & O. 230.	333.9743
Do.	B. & O. 148.	100.4504	Do.	B. & O. 231.	327.2753
Do.	B. & O. 149.	96.0261	Do.	B. & O. 232.	318.6468
Near Reels Mill, Md.	B. & O. 150.	88.9433	Near Indian Creek, Pa.	B. & O. 233.	310.0676
Reels Mill, Md.	B. & O. 151.	83.5343	Indian Creek, Pa.	B. & O. 234.	295.3708
Frederick Junction, Md.	B. & O. 152.	81.1218	Do.	U. S. G. S.	295.6553
Near Frederick Jct., Md.	B. & O. 152A.	86.8529	Near Indian Creek, Pa.	B. & O. 235.	289.9153
Near Frederick, Md.	B. & O. 152B.	92.2256	Do.	B. & O. 236.	286.6006
Frederick, Md.	B. & O. 152C.	88.1769	Do.	B. & O. 237.	285.8429
Near Frederick Jct., Md.	B. & O. 153.	76.8810	Do.	B. & O. 238.	280.0899
Do.	B. & O. 153A.	76.5793	Near South Connellsville, Pa.	B. & O. 239.	277.4800
Near Lime Kiln, Md.	B. & O. 154.	82.8743	Near Connellsville, Pa.	B. & O. 240.	269.5519
Do.	B. & O. 155.	86.4526	Connellsville, Pa.	B. & O. 240A—U. S. G. S.	269.5987
Near Buckeystown Station, Md.	B. & O. 156.	84.5901	Near Connellsville, Pa.	B. & O. 241.	267.1397
Buckeystown Station, Md.	B. & O. 156A.	86.0027	Do.	B. & O. 242.	266.2726
Near Buckeystown, Md.	B. & O. 157.	91.1798	Near Broad Ford Junction, Pa.	B. & O. 243.	263.7757
Near Adamstown, Md.	B. & O. 158.	94.5882	Broad Ford, Pa.	B. & O. 244.	261.2999
Near Doubts, Md.	B. & O. 159.	87.0272	Near Broad Ford, Pa.	B. & O. 245.	260.5206
Do.	B. & O. 160.	88.5698	Do.	B. & O. 246.	260.4318
Near Washington Jct., Md.	B. & O. 161.	87.3789	Near Dawson, Pa.	B. & O. 246A.	259.1870
Do.	B. & O. 162.	78.4997	Do.	B. & O. 247.	258.2614
Washington Junction, Md.	B. & O. 44.	71.8979	Do.	B. & O. 248.	254.9641
Near Adamstown, Md.	B. & O. 163.	86.8533	Do.	B. & O. 249.	255.8289
Near Doubts, Md.	B. & O. 164.	82.4902	Near Lavenia, Pa.	B. & O. 250.	254.4237
Near Washington Jct., Md.	B. & O. 165.	76.8320	Lavenia, Pa.	B. & O. 251.	254.0601
Glenocs, Pa.	B. & O. 177.	489.3065	Near Layton, Pa.	B. & O. 253.	246.6293
Near Glencoe, Pa.	B. & O. 178.	502.2141	Layton, Pa.	B. & O. 254.	245.5186
Do.	B. & O. 179.	514.7059	Near Layton, Pa.	B. & O. 255.	244.5029
Philson, Pa.	B. & O. 180.	546.0442	Do.	B. & O. 256.	241.5016
Near Philson, Pa.	B. & O. 181.	574.3704	Near Banning, Pa.	B. & O. 257.	240.8111
Do.	B. & O. 182.	605.6893	Near Jacobs Creek, Pa.	B. & O. 258.	238.7651
Near Mance, Pa.	B. & O. 182A.	610.3774	Near Eureka, Pa.	B. & O. 259.	237.0056
Do.	B. & O. 183.	628.7606	Smithton, Pa.	B. & O. 260.	236.4092
Do.	B. & O. 184.	641.0720	Near Port Royal, Pa.	B. & O. 261.	236.9424
Do.	B. & O. 185.	676.4482	Do.	B. & O. 262.	235.9254
Near Sand Patch, Pa.	B. & O. 186.	693.1005	Near Reduction, Pa.	B. & O. 263.	235.8814
Sand Patch, Pa.	B. & O. 187.	687.2791	Do.	B. & O. 264.	234.8238
Keystone, Pa.	B. & O. 188.	660.8841	Griffin, Pa.	B. & O. 264A.	233.7796
Near Myersdale, Pa.	B. & O. 189.	642.1933	Near West Newton, Pa.	B. & O. 265.	234.3018
Myersdale, Pa.	B. & O. 190.	625.9584	West Newton, Pa.	B. & O. 266.	233.7969
Near Salisbury Jct., Pa.	B. & O. 191.	608.1231	Near West Newton, Pa.	B. & O. 266A.	232.8774
Do.	B. & O. 192.	592.4290	Do.	B. & O. 267.	233.2345
Near Garrett, Pa.	B. & O. 193.	590.5749	Near Gratztown, Pa.	B. & O. 268.	231.6481
Do.	B. & O. 194.	598.5024	Do.	B. & O. 269.	233.2523
Do.	B. & O. 195.	587.8883	Suter, Pa.	B. & O. 270.	232.0656
Do.	B. & O. 196.	583.0288	Near Scott Haven, Pa.	B. & O. 271.	233.0885
Do.	B. & O. 197.	577.0236	Vista, Pa.	B. & O. 273.	232.8697
McSpadden, Pa.	B. & O. 198.	569.3814	Shaner, Pa.	B. & O. 274.	231.2638
Near McSpadden, Pa.	B. & O. 199.	566.4073	Guffey, Pa.	B. & O. 275.	229.6159
Near Rockwood, Pa.	B. & O. 200.	562.5522	Near Coulter, Pa.	B. & O. 276.	229.6970
Do.	B. & O. 201.	556.8338	Do.	B. & O. 277.	229.4042
Rockwood, Pa.	B. & O. 202.	551.7486	Do.	B. & O. 278.	229.3771
Near Rockwood, Pa.	B. & O. 203.	547.5410	Do.	B. & O. 279.	229.3903
Do.	B. & O. 204.	542.8467	Near Versailles, Pa.	B. & O. 280.	229.7173
Near Casselman, Pa.	B. & O. 205.	537.5633	Do.	B. & O. 280A.	228.4736
Casselman, Pa.	B. & O. 206.	529.2610	Versailles, Pa.	B. & O. 281.	227.9655
Near Casselman, Pa.	B. & O. 207.	523.0525	Near Christy Park, Pa.	B. & O. 282.	228.6020
Near Markleton, Pa.	B. & O. 208.	516.9333	Near McKeesport, Pa.	B. & O. 283.	228.5752
Markleton, Pa.	B. & O. 209.	511.0130	McKeesport, Pa.	B. & O. 284.	228.8896
Pinkerton, Pa.	B. & O. 210.	499.9418	Do.	B. & O. 285.	228.6196
Near Pinkerton, Pa.	B. & O. 211.	490.1815	Demmler, Pa.	B. & O. 286.	228.7453
Fort Hill, Pa.	B. & G. 212.	482.0118	Near Bessemer, Pa.	B. & O. 287.	229.3037
Near Fort Hill, Pa.	B. & O. 213.	472.1930	Do.	B. & O. 287A.	227.5521
Do.	B. & O. 214.	457.9077	Bessemer, Pa.	B. & O. 288.	229.3197
Near Ursina, Pa.	B. & O. 215.	442.2572	Near Braddock, Pa.	B. & O. 289.	228.3004
Near Confluence, Pa.	B. & O. 216.	425.6272	Rankin, Pa.	B. & O. 290.	229.9788
Confluence, Pa.	B. & O. 217.	405.9910	Near Rankin, Pa.	B. & O. 291.	229.1803
Near Confluence, Pa.	B. & O. 218.	402.8666	Near Highland, Pa.	B. & O. 292.	228.6791
Do.	B. & O. 219.	396.2012	Highland, Pa.	B. & O. 292A.	225.6977
Near Bidwell, Pa.	B. & O. 220.	394.8801	Wheeling Junction, Pa.	B. & O. 293.	231.9136
Bidwell, Pa.	B. & O. 221.	391.8779	Near Glenwood, Pa.	B. & O. 294.	234.7403
Near Bidwell, Pa.	B. & O. 222.	392.5958	Marion Junction, Pa.	B. & O. 295.	233.4097

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Laughlin Junction, Pa.	B. & O. 296	230.1277	Beaver Falls, Pa.	B. F. Depot (1906)	240.5598
Pittsburg, Pa.	B. & O. 297	227.3961	Kenwood, Pa.	Br. 29	228.4102
Do.	B. & O. 298	228.3806	New Brighton, Pa.	New Brighton Depot	228.3799
Do.	B. & O. 299	226.6472	Near New Brighton, Pa.	Br. 274	223.7951
Do.	B. & O. 300	227.7218	Do.	Br. 23	217.1467
Near Laughlin Jct., Pa.	B. & O. 301	234.0066	Monaca, Pa.	25A	228.7387
Do.	B. & O. 302	249.1317	Do.	25C	206.2284
Do.	B. & O. 303	256.4281			
Do.	B. & O. 304	250.7368			
Do.	B. & O. 305	243.9731			
Pittsburg, Pa.	B. & O. 306	229.8407	Near Rock Point, Pa.	B. & O. 351	265.9491
Lawrenceville, Pa.	P. R. R. 96	239.0011	Do.	B. & O. 352	262.1978
Pittsburg, Pa.	B. & O. 306A	227.1119	Chewton, Pa.	B. & O. 353	258.4366
Near Pittsburg, Pa.	B. & O. 307	226.6311	Near Chewton, Pa.	B. & O. 354	249.5614
Allegheny, Pa.	B. & O. 308A	223.4151	Do.	B. & O. 355	245.2405
Do.	B. & O. 308B	220.1208	West Pittsburg, Pa.	B. & O. 356	245.3483
Do.	B. & O. 308C	218.7006	Near West Pittsburg, Pa.	B. & O. 357	243.8919
Do.	B. & O. 308D	221.1056	Near Newcastle Jct., Pa.	B. & O. 359	241.7626
Near Sharpsburg, Pa.	B. & O. 310—P. R. R. 5	223.4287	Do.	B. & O. 359A	243.0621
Do.	B. & O. 310A	221.5511	Mahoningtown, Pa.	U. S. G. S.	239.4290
Sharpsburg, Pa.	B. & O. 311	222.6573	Near Mahoningtown, Pa.	B. & O. 360	240.7386
Near Sharpsburg, Pa.	B. & O. 311A	225.2042	Do.	B. & O. 361	239.8484
Do.	B. & O. 312	230.8398	Do.	B. & O. 362	239.9911
Wittmer, Pa.	B. & O. 313	236.3778	Do.	B. & O. 363	239.9156
Glenshaw, Pa.	B. & O. 314	240.5211	Do.	B. & O. 364	241.0714
Mount Royal, Pa.	B. & O. 314A	248.2285	Near Edensburg, Pa.	B. & O. 365	241.0244
Elfinwild, Pa.	B. & O. 315	253.9712	Do.	B. & O. 366	242.0199
Allison Park, Pa.	B. & O. 316	256.5127	Do.	B. & O. 367	243.4590
Near Allison Park, Pa.	B. & O. 316A	260.0251	Do.	B. & O. 368	244.0648
Do.	B. & O. 317	265.9068	Do.	B. & O. 369	246.1557
Near Bryant, Pa.	B. & O. 318	272.1302	Near Lowellville, Ohio	B. & O. 370	246.4191
Do.	B. & O. 318A	275.0858	Do.	B. & O. 371	246.6901
Wildwood, Pa.	B. & O. 319	278.9448	Near Lowellville, Ohio	B. & O. 372	250.1670
Near Wildwood, Pa.	B. & O. 319A	283.4745	Near Lowellville, Ohio	B. & O. 373	254.1752
Do.	B. & O. 320	292.3059	Near Struthers, Ohio	B. & O. 374	255.8744
Do.	B. & O. 321	305.8377	Do.	B. & O. 375	252.7909
Near Gibsonia, Pa.	B. & O. 322	325.5002			
Do.	U. S. G. S.	314.1673	Near Alliance, Ohio	Br. 66	334.0706
Near Bakerstown, Pa.	B. & O. 323	350.5504	Alliance, Ohio	Qs.	336.1924
Do.	B. & O. 324	358.4149	Do.	City	336.8426
Near Valencia, Pa.	B. & O. 325	336.4857	Do.	Rs.	341.1364
Near Downsville, Pa.	B. & O. 326	321.0264	Do.	Lunch Room	331.4677
Do.	B. & O. 326A	315.7640	Near Alliance, Ohio	Br. 65 (1906)	321.5673
Mars, Pa.	B. & O. 327	312.5804	Do.	Br. 64 (1906)	323.8286
Near Mars, Pa.	B. & O. 328	305.9292	Near Sebring, Ohio	West Culvert	338.2771
Do.	B. & O. 329	301.2799	Do.	East Culvert	337.1215
Near Callery Junction, Pa.	B. & O. 330	298.2230	Near Snodes, Ohio	Se.	332.3711
Callery Junction, Pa.	B. & O. 330A	296.3339	Near Berlin Center, Ohio	Te.	331.9553
Near Callery Junction, Pa.	B. & O. 331	295.7054	Do.	Ue.	330.6635
Near Evans City, Pa.	B. & O. 332	290.8501	Berlin Center, Ohio	Ve.	337.1559
Evans City, Pa.	B. & O. 333	296.0027	Ellsworth, Ohio	We.	341.5797
Near Evans City, Pa.	B. & O. 334	283.3090	Rosemont, Ohio	Xe.	326.5803
Do.	B. & O. 335	281.5993	Do.	Ye.	329.4522
Do.	B. & O. 335A	278.4901	Do.	Ze.	324.7824
Near Harmony Junction, Pa.	B. & O. 336	279.1013	North Jackson, Ohio	Ar.	306.2667
Near Harmony, Pa.	B. & O. 337	278.2352	Do.	Br.	312.3055
Do.	B. & O. 338	278.9973	Near North Jackson, Ohio	Ci.	305.2461
Near Zelienople, Pa.	B. & O. 339	277.0242	Lordstown, Ohio	Di.	286.2588
Do.	B. & O. 340	273.5202	Near Lordstown, Ohio	Ei.	280.3692
Old Furnace, Pa.	B. & O. 341	274.2742	Near Boenna Crossing, Ohio	Fi.	274.1200
Near Old Furnace, Pa.	B. & O. 341A	271.6106	Near Niles, Ohio	Gi.	268.0337
Near Fombell, Pa.	B. & O. 342	269.8479	Near Girard, Ohio	Hi.	268.1514
Fombell, Pa.	B. & O. 343	267.6161	Near Youngstown, Ohio	Ii.	269.4011
Goehring, Pa.	B. & O. 344	266.4228	Do.	Ji.	263.7477
Celia, Pa.	B. & O. 345	265.6722	Do.	B. & O. 381	256.6708
Near Hazen, Pa.	B. & O. 346	264.2360	Youngstown, Ohio	B. & O. 380	257.1624
Near McKimms, Pa.	B. & O. 347	264.3621	Do.	R. R.	258.2021
Do.	B. & O. 348	264.1852	Hazelton, Ohio	837 ADJ	254.9506
North Sewickley, Pa.	B. & O. 348A	267.7214	Near Struthers, Ohio	B. & O. 377	258.2072
			At Struthers, Ohio	B. & O. 376	257.4851
Near Ellwood City, Pa.	B. & O. 349	271.3996			
Ellwood City, Pa.	B. & O. 349A	274.5818	Akron, Ohio	B. & O. 441	307.6013
Near Ellwood City, Pa.	B. & O. 350	267.1206	Do.	B. & O. 442	302.9448
Near West Ellwood Jct., Pa.	As.	237.7386	Near Akron, Ohio	B. & O. 443	297.7708
Homewood, Pa.	Br. 38 (1906)	290.1397	Barberton, Ohio	B. & O. 444—P. R. R.	295.0801
Near Homewood, Pa.	Br. 39 (1906)	291.9751	Near Barberton, Ohio	B. & O. 445	294.2045
Summit, Pa.	Br. 40	319.4176	Do.	B. & O. 446	296.1181
Mayfield, Pa.	Br. 34	261.7748	Near Turkeyfoot Junction, Ohio	B. & O. 447	295.2074
Geneva, Pa.	Geneva Depot (1906)	252.6184	Messenger, Ohio	P. R. R. 1	292.7390

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Clinton, Ohio.	B. & O. 448.	288.2461	Near Republic, Ohio.	P <sub>1</sub>	265.8713
Near Warwick, Ohio.	B. & O. 449.	292.1003	Near Seneca, Ohio.	Q <sub>3</sub>	250.7038
Do.	B. & O. 450.	292.1878	Near Tiffin, Ohio.	R <sub>1</sub>	240.9790
Do.	B. & O. 451.	288.7616	Do.	S <sub>1</sub>	232.4006
Near Easton, Ohio.	B. & O. 452.	288.9537	Tiffin, Ohio.	757 Col.	231.1126
Do.	B. & O. 453.	290.8791	Do.	775 Tiffin.	236.3108
Do.	B. & O. 454.	292.3014	Do.	T <sub>1</sub>	226.1013
Easton, Ohio.	B. & O. 455.	292.8030	Near Tiffin, Ohio.	U <sub>1</sub>	232.0122
Near Easton, Ohio.	B. & O. 456.	291.2108	Near Bascom, Ohio.	V <sub>1</sub>	223.0998
Near Rittman, Ohio.	B. & O. 457.	291.7259	Do.	W <sub>1</sub>	237.2082
Do.	B. & O. 458.	293.1734	Bascom, Ohio.	776 Bascom.	236.6859
Do.	B. & O. 459.	295.4166	Do.	766 Tol.	233.8750
Do.	B. & O. 460.	295.6272	Near Bascom, Ohio.	X <sub>1</sub>	234.1998
Near Sterling, Ohio.	B. & O. 460A—U. S. G. S.	293.7298	Near Fostoria, Ohio.	Y <sub>1</sub>	233.9062
Do.	B. & O. 461.	295.7964	Do.	Z <sub>1</sub>	234.1665
Do.	B. & O. 462.	297.1866	Fostoria, Ohio.	778 Fostoria.	237.6998
Do.	B. & O. 463.	299.4800	Do.	A <sub>1</sub>	238.0711
Near Creston, Ohio.	B. & O. 464.	300.9374	Do.	B <sub>1</sub>	238.6213
Do.	B. & O. 465.	296.9493	Near Fostoria, Ohio.	C <sub>1</sub>	235.7889
Do.	B. & O. 466.	293.1902	Near Godsend, Ohio.	D <sub>1</sub>	229.9578
Do.	B. & O. 467.	294.6676	Near Bloomdale, Ohio.	740 Tol.	225.7430
Near Lodi, Ohio.	B. & O. 468.	295.7302	Do.	E <sub>1</sub>	226.4590
Do.	B. & O. 469.	290.2257	Bloomdale, Ohio.	749 Bloomdale.	228.5307
Do.	B. & O. 470.	284.0406	Do.	F <sub>1</sub>	229.2827
Lodi, Ohio.	B. & O. 471.	278.5241	Bairdstown, Ohio.	H <sub>1</sub>	225.4161
Near Lodi, Ohio.	B. & O. 472.	278.5249	Galatea, Ohio.	I <sub>1</sub>	221.7295
Do.	B. & O. 473.	278.6989	North Baltimore, Ohio.	J <sub>1</sub>	223.7290
Do.	B. & O. 474.	287.5864	Near N. Baltimore, Ohio.	726 Tol.	221.4503
Do.	B. & O. 475.	302.1236	Do.	K <sub>1</sub>	221.7605
Near Homer, Ohio.	B. & O. 476.	308.1928	Do.	L <sub>1</sub>	218.6596
Do.	B. & O. 477.	327.4042	Do.	M <sub>1</sub>	217.9481
Near Newtons, Ohio.	B. & O. 478.	333.8431	Near Hoytville, Ohio.	N <sub>1</sub>	215.6699
Do.	B. & O. 479.	333.6088	Do.	O <sub>1</sub>	216.1918
Do.	B. & O. 480.	335.5875	Near Deshler, Ohio.	P <sub>1</sub>	216.8867
Near Sullivan, Ohio.	B. & O. 481.	341.1624			
Sullivan, Ohio.	1136 Canton.	346.6934	Near Warwick, Ohio.	B. & O. 449.	292.1003
Do.	B. & O. 482.	342.0659	Do.	B. & O. 1.	290.2837
Near Sullivan, Ohio.	B. & O. 483.	343.4650	Do.	B. & O. 2.	290.1822
Near Nova, Ohio.	B. & O. 484.	345.8447	Near Canal Fulton, Ohio.	B. & O. 3.	290.5270
Do.	B. & O. 485.	342.3938	Canal Fulton, Ohio.	B. & O. 4.	288.7131
Nova, Ohio.	B. & O. 485A.	338.6487	Near Canal Fulton, Ohio.	B. & O. 5.	290.0730
Do.	1127 ADJ.	343.6063	Do.	B. & O. 6.	287.9055
Near Nova, Ohio.	B. & O. 486.	336.4835	Near Pauls, Ohio.	B. & O. 7.	286.2346
Do.	B. & O. 487.	326.6057	Near Crystal Spr., Ohio.	B. & O. 8.	287.2624
Near Hereford, Ohio.	B. & O. 488.	320.0819	Do.	B. & O. 9.	286.6361
Do.	B. & O. 489.	316.2602	Do.	B. & O. 10.	289.0546
Do.	B. & O. 490.	309.3404	Near Massillon, Ohio.	B. & O. 11.	284.5194
Do.	B. & O. 491.	301.2827	Do.	B. & O. 12.	284.7170
Near Ramey, Ohio.	B. & O. 492.	305.0162	Do.	P. R. R.	287.2062
Near Greenwich, Ohio.	B. & O. 493.	313.6348	Do.	B. & O. 13.	286.9267
Do.	B. & O. 494.	317.7419	Do.	P. R. R. Br. 5.	286.2935
Do.	B. & O. 495.	316.6753	Do.	B. & O. 14.	285.0790
			Do.	B. & O. 15.	284.4928
Near Greenwich, Ohio.	B. & O. 496.	313.8298	Do.	B. & O. 16.	282.7136
Do.	B. & O. 497.	307.6727	Do.	B. & O. 17.	286.5430
Do.	B. & O. 498.	310.1276	Near Navarre, Ohio.	B. & O. 18.	298.9937
Do.	B. & O. 499.	315.6783	Do.	B. & O. 19.	305.8788
Near Boughtonville, Ohio.	B. & O. 500.	310.9366	Near Justus, Ohio.	B. & O. 20.	304.9296
Boughtonville, Ohio.	B. & O. 501.	301.2418	Do.	B. & O. 21.	297.7217
Near Boughtonville, Ohio.	B. & O. 502.	293.9466	Do.	B. & O. 22.	297.1747
			Near Beach City, Ohio.	B. & O. 23.	297.5340
Near Boughtonville, Ohio.	B. & O. 503.	290.6965	Beach City, Ohio.	B. & O. 24.	295.5166
Near Chicago Jct., Ohio.	B. & O. 504.	285.1359	Near Beach City, Ohio.	B. & O. 25.	293.2267
Do.	B. & O. 505.	285.9013	Do.	B. & O. 26.	287.9459
Do.	B. & O. 506.	282.9083	Near Strasburg, Ohio.	B. & O. 27.	283.3955
Chicago Jct., Ohio.	B. & O. 507.	278.8294	Do.	B. & O. 28.	281.8967
Do.	F <sub>1</sub>	279.8501	Strasburg, Ohio.	B. & O. 29.	278.6550
Do.	G <sub>1</sub>	283.3627	Near Strasburg, Ohio.	B. & O. 30.	278.2211
Do.	H <sub>1</sub>	282.2049	Do.	B. & O. 31.	277.3160
Near Chicago Jct., Ohio.	I <sub>1</sub>	278.1595	Do.	B. & O. 32.	274.8477
Do.	J <sub>1</sub>	277.6548	Do.	B. & O. 33.	273.4636
Do.	K <sub>1</sub>	281.0836	Near Canal Dover, Ohio.	B. & O. 34.	270.1067
Siam, Ohio.	L <sub>1</sub>	290.5294	Do.	B. & O. 35.	268.8080
Do.	M <sub>1</sub>	291.2021	Do.	B. & O. 36.	266.6570
Near Siam, Ohio.	N <sub>1</sub>	290.9974	Do.	B. & O. 37.	269.7535
Near Scipio, Ohio.	O <sub>1</sub>	283.0774	Do.	B. & O. 38.	272.2109
Near Republic, Ohio.	859 Republic.	262.2361	Near New Philadelphia, Ohio.	B. & O. 39.	270.7767
Do.	883 Col.	269.4882	Do.	B. & O. 40.	267.8323
			Near Philadelphia, Ohio.		

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation.	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near New Philadelphia, Ohio.	B. & O. 41.	264.1921	Near Riggs, W. Va.	B. & O. 61.	756.3998
Do.	B. & O. 42.	261.8994	Near Terra Alta, W. Va.	B. & O. 62.	769.2490
Do.	B. & O. 43.	260.9619	Terra Alta, W. Va.	B. & O. 63.	775.7902
Near Goshen, Ohio.	B. & O. 44.	260.8770	Near Terra Alta, W. Va.	B. & O. 64.	765.8868
Do.	B. & O. 45.	259.2871	Do.	B. & O. 65.	730.1410
Near Midvale, Ohio.	B. & O. 46.	259.1036	Do.	B. & O. 66.	689.8274
Do.	B. & O. 47.	260.1090	Do.	B. & O. 67.	654.3907
Cumberland, Md.	B. & O. 1.	197.4189	Near Rodamers, W. Va.	B. & O. 68.	637.4012
Near Robert Station, Md.	B. & O. 3.	192.9117	Near Amblersburg, W. Va.	B. & O. 69.	587.7540
Do.	B. & O. 4.	194.3027	Do.	B. & O. 70.	552.1630
Near Cedar Cliff, Md.	B. & O. 5.	197.6734	Do.	B. & O. 71.	517.4134
Do.	B. & O. 6.	197.4212	Amblersburg, W. Va.	B. & O. 72.	494.8825
Near Brady, Md.	B. & O. 6A.	197.2904	Near Amblersburg, W. Va.	B. & O. 73.	462.1824
Do.	B. & O. 7.	201.2135	Near Rowlesburg, W. Va.	B. & O. 74.	449.0225
Do.	B. & O. 7A.	203.2009	Do.	B. & O. 74A.	442.0736
Near McKenzie Sta., Md.	B. & O. 8.	207.4956	Do.	B. & O. 75.	426.9821
Potomac Station, Md.	B. & O. 9.	209.8079	Do.	B. & O. 76.	454.3489
Near Pinto, Md.	B. & O. 10.	204.9733	Do.	B. & O. 76A.	465.9620
Near Lowndes, Md.	B. & O. 11.	208.2515	Do.	B. & O. 77.	481.9178
Near Cresar, Md.	B. & O. 12.	213.0023	Do.	B. & O. 78.	516.9043
Rawlings, Md.	B. & O. 13.	214.4501	Near Buckhorn, W. Va.	B. & O. 78A.	525.7440
Near Rawlings, Md.	B. & O. 14.	218.9442	Do.	B. & O. 79.	548.5738
Near Black Oak, Md.	B. & O. 15.	220.9687	Near Anderson, W. Va.	B. & O. 80.	566.0882
Black Oak, Md.	B. & O. 16.	226.7121	Near Tunnelton, W. Va.	B. & O. 81.	557.2909
Near Black Oak, Md.	B. & O. 17.	225.6294	Do.	B. & O. 82.	556.6983
Near Dawson, Md.	B. & O. 18.	230.4526	Do.	B. & O. 83.	543.6579
Do.	B. & O. 19.	235.5613	Near West End, W. Va.	B. & O. 83A.	531.1790
Do.	B. & O. 20.	236.5793	Near Austen, W. Va.	B. & O. 84.	496.1806
Do.	B. & O. 21.	240.8628	Do.	B. & O. 85.	473.2623
Near Keyser, W. Va.	B. & O. 22.	244.0544	Do.	B. & O. 86.	440.0907
Keyser, W. Va.	B. & O. 23.	252.0699	Near Newburg, W. Va.	B. & O. 87.	407.9774
Near Keyser, W. Va.	B. & O. 24.	255.2995	Do.	B. & O. 88.	379.4742
Do.	B. & O. 25.	260.4764	Near Independence, W. Va.	B. & O. 90.	349.7056
Near Piedmont, W. Va.	B. & O. 26.	265.5667	Near Hardman, W. Va.	B. & O. 91.	337.7650
Do.	B. & O. 26A.	271.0511	Near Ironton, W. Va.	B. & O. 92.	335.7271
Do.	B. & O. 27.	276.1753	Do.	B. & O. 93.	327.5981
Do.	B. & O. 28.	284.3529	Do.	B. & O. 94.	324.4447
Near W. Va. Central Junction, W. Va.	B. & O. 28A.	289.0431	Near Thornton, W. Va.	B. & O. 95.	320.5681
Near Bloomington, Md.	B. & O. 29.	307.5010	Thornton, W. Va.	B. & O. 96.	317.0433
Do.	B. & O. 30.	333.3177	Near Thornton, W. Va.	B. & O. 97.	316.8887
Near Black Bear, Md.	B. & O. 31.	368.8165	Do.	B. & O. 98.	315.1878
Do.	B. & O. 31A.	360.0908	Do.	B. & O. 99.	315.2022
Do.	B. & O. 32.	363.7418	Near Grafton, W. Va.	B. & O. 100.	311.2908
Near Bond Station, Md.	U. S. G. S.	420.7591	Do.	B. & O. 101.	306.9772
Do.	B. & O. 33.	440.5442	Grafton, W. Va.	B. & O. 102.	303.2915
Crabtree, Md.	B. & O. 34.	476.7437	Near Grafton, W. Va.	B. & O. 103.	302.2994
Near Frankville, Md.	B. & O. 35.	509.1254	Fetterman, W. Va.	B. & O. 103A.	299.5031
Do.	B. & O. 36.	549.8896	Near Fetterman, W. Va.	B. & O. 104.	301.3860
Do.	B. & O. 37.	582.4499	Do.	B. & O. 105.	301.7224
Do.	B. & O. 38.	617.9455	Do.	B. & O. 105A.	299.3736
Near Swanton, Md.	B. & O. 39.	666.1339	Do.	B. & O. 106.	298.9014
Do.	B. & O. 40.	692.3717	Near Bush, W. Va.	B. & O. 107A.	298.6519
Do.	B. & O. 40A.	700.2183	Do.	B. & O. 108.	299.2841
Do.	B. & O. 41.	725.8597	Near Valley Falls, W. Va.	B. & O. 109.	299.5916
Do.	B. & O. 42.	742.4489	Valley Falls, W. Va.	B. & O. 110.	290.9223
Near Altamont, Md.	B. & O. 43.	774.7940	Near Valley Falls, W. Va.	B. & O. 111.	288.0172
Do.	B. & O. 44.	800.9966	Near Hammond, W. Va.	B. & O. 112.	285.8582
Do.	B. & O. 45.	785.9294	Do.	B. & O. 113.	278.7200
Near Deer Park, Md.	B. & O. 46.	770.0707	Near Powells, W. Va.	B. & O. 114.	273.8402
Deer Park, Md.	B. & O. 47.	753.9231	Do.	B. & O. 115.	273.9812
Do.	B. & O. 47A.	748.4989	Near Colfax, W. Va.	B. & O. 116.	271.1028
Do.	U. S. G. S.	745.9033	Colfax, W. Va.	B. & O. 117.	270.8204
Near Deer Park, Md.	B. & O. 48.	742.7663	Near Colfax, W. Va.	B. & O. 118.	269.8671
Near Mountain Lake Park, Md.	B. & O. 49.	738.3505	Near Bentons Ferry, W. Va.	B. & O. 119.	270.3984
Do.	B. & O. 50.	732.9489	Bentons Ferry, W. Va.	B. & O. 120.	270.7712
Do.	B. & O. 51.	730.6054	Kingmont, W. Va.	B. & O. 121.	270.7553
Near Oakland, Md.	B. & O. 52.	726.3818	Near Kingmont, W. Va.	B. & O. 122.	268.6999
Oakland, Md.	B. & O. 53.	722.6588	Do.	B. & O. 122A.	268.6306
Near Oakland, Md.	B. & O. 53A.	724.5474	Gaston Junction, W. Va.	B. & O. 123.	269.8240
Do.	B. & O. 54.	724.7267	Fairmont, W. Va.	B. & O. 124.	270.2427
Do.	B. & O. 55.	732.2324	Near Fairmont, W. Va.	B. & O. 125.	269.5139
Do.	B. & O. 56.	744.5406	Do.	B. & O. 125A.	264.7704
Near Skipnish, Md.	B. & O. 57.	748.1175	Near Barnesville, W. Va.	B. & O. 126.	266.2566
Near Hutton, Md.	B. & O. 58.	756.5985	Do.	B. & O. 127.	267.7335
Do.	B. & O. 59.	745.4096	Near Barrackville, W. Va.	B. & O. 128.	270.4915
Near Corinth, W. Va.	B. & O. 59A.	742.1401	Do.	B. & O. 129.	272.4751
Near Rinard, W. Va.	B. & O. 60.	747.5402	Barrackville Sta., W. Va.	B. & O. 130.	274.7703
			Near Barrackville, W. Va.	B. & O. 131.	277.1361

## Corrected elevations of permanent bench marks—Continued.

Place.	Designation of bench mark.	Corrected elevation	Place.	Designation of bench mark.	Corrected elevation.
		<i>meters.</i>			<i>meters.</i>
Near Barrackville, W. Va.	B. & O. 132.	278.3947	Near Board Tree, W. Va.	B. & O. 168.	308.5416
Near Katy, W. Va.	B. & O. 133.	280.1659	Near Bellton, W. Va.	B. & O. 169.	284.4361
Near Farmington, W. Va.	B. & O. 134.	281.1673	Do.	B. & O. 170.	273.5705
Do.	B. & O. 135.	284.0032	Near Denver Sta., W. Va.	B. & O. 170A.	270.9798
Underwood Station, W. Va.	B. & O. 136.	284.8554	Near Bellton, W. Va.	B. & O. 171.	277.6329
Near Farmington, W. Va.	B. & O. 137.	285.6692	Near Woodruff, W. Va.	B. & O. 172.	288.6007
Do.	B. & O. 138.	286.6148	Do.	B. & O. 173.	308.3787
Near Downs, W. Va.	B. & O. 139.	288.9993	Near Cogley, W. Va.	B. & O. 174.	331.4485
Do.	B. & O. 139A.	290.4971	Do.	B. & O. 175.	356.0496
Do.	U. S. G. S.	290.5039	Near Cameron, W. Va.	B. & O. 176.	365.5244
Downs, W. Va.	B. & O. 140.	293.2782	Do.	B. & O. 177.	343.0378
Near Downs, W. Va.	B. & O. 141.	293.5120	Do.	B. & O. 178.	323.9492
Near Mannington, W. Va.	B. & O. 142.	295.2662	Do.	B. & O. 179.	315.4555
Do.	B. & O. 143.	295.6423	Loudenville, W. Va.	B. & O. 180.	303.5117
Mannington, W. Va.	B. & O. 144.	297.0238	Near Loudenville, W. Va.	B. & O. 181.	300.6636
Do.	U. S. G. S.	297.1410	Near Glen Easton, W. Va.	B. & O. 182.	298.0746
Near Mannington, W. Va.	B. & O. 145.	297.1644	Do.	B. & O. 183.	294.0413
Do.	B. & O. 146.	299.2739	Do.	B. & O. 184.	282.4085
Do.	B. & O. 147.	301.6045	Do.	B. & O. 184A.	282.5775
Do.	B. & O. 148.	302.1113	Do.	B. & O. 185.	275.0472
Near Metz, W. Va.	B. & O. 149.	304.7391	Near Rosbys Rock, W. Va.	B. & O. 186.	292.6913
Do.	B. & O. 150.	305.8239	Do.	B. & O. 187.	258.3516
Do.	B. & O. 151.	310.2489	Do.	B. & O. 188.	245.1835
Near Glover Gap, W. Va.	B. & O. 152.	315.5132	Do.	B. & O. 189.	240.4904
Do.	B. & O. 153.	322.4004	Do.	B. & O. 190.	232.9940
Do.	B. & O. 153A.	330.5101	Do.	B. & O. 191.	226.0836
Do.	B. & O. 154.	341.0548	Do.	B. & O. 192.	218.9130
Near Cottonwood, W. Va.	B. & O. 155.	343.3094	Do.	B. & O. 193=U. S. G. S.	207.4149
Cottonwood, W. Va.	B. & O. 156.	332.4421	Near Moundsville, W. Va.	B. & O. 194.	197.9742
Burton, W. Va.	B. & O. 157.	324.7038	Do.	B. & O. 195=U. S. G. S.	197.0559
Near Burton, W. Va.	B. & O. 158.	316.7363	Do.	B. & O. 196.	196.8510
Near Hundred, W. Va.	B. & O. 159.	313.9890	Do.	B. & O. 197.	203.6681
Do.	B. & O. 160.	308.7311	Do.	B. & O. 198.	203.4905
Do.	B. & O. 161.	303.4300	Do.	B. & O. 199.	204.0314
Do.	B. & O. 161A.	300.5860	Near Benwood Jct., W. Va.	B. & O. 200.	200.7170
Near Littleton, W. Va.	B. & O. 162.	295.4333	Do.	B. & O. 200A.	200.5442
Do.	B. & O. 163.	289.7087	Do.	B. & O. 201.	202.8564
Do.	B. & O. 163A.	287.9051	Do.	B. & O. 202.	203.8291
Littleton, W. Va.	B. & O. 164.	286.9139	Do.	B. & O. 114.	209.7623
Near Littleton, W. Va.	B. & O. 165.	309.7366	Benwood, W. Va.	U. S. E. 94A.	197.5211
Near Board Tree, W. Va.	B. & O. 166.	337.9832	Marietta, Ohio.	U. S. E. 171B.	180.2311
Do.	B. & O. 167.	330.3747			

## DESCRIPTIONS OF BENCH MARKS.\*

## GENERAL NOTES DESCRIBING DIFFERENT FORMS AND MARKINGS OF BENCH MARKS CONNECTED WITH THE LEVEL NET.

NOTE 1.—This type of bench mark is the red metal disk designed by the Coast and Geodetic Survey, lettered "U. S. Coast and Geodetic Survey, B. M. \$250 fine or imprisonment for disturbing this mark." The disk is 3 inches in diameter, with a 3-inch tenon upon the back for setting it, and is set in cement flush with a horizontal or vertical surface. In the latter case a horizontal mark cut on it, or the horizontal mark of a cross, is the bench mark.

NOTE 2.—This type of bench mark has the same lettering as that referred to in note 1, and is a 3-inch red metal cap, somewhat curved, screwed upon a 4-foot or 4½-foot iron pipe set in the ground and usually cemented at the base, from 4 to 6 inches being exposed above the ground. The base of the pipe is split and spread to a diameter of about a foot. For placing the foot of the level rod accurately a square or a small circle was cut in outline in the center of the cap.

NOTE 3.—This type of bench mark is a stone post 4 feet long set in the ground with 6 inches exposed, and this portion is dressed. The upper surface is 6 inches square and plane, being marked in the center with a ½-inch copper bolt, 2 inches long, set flush with the surface; the top of the bolt is the bench mark; the upper surface of the stone is lettered "U. S. B. M." and when the post is set near the railroad these letters face the track.

\* Any person who finds that one of the bench marks here described is disturbed, or that the description no longer fits the facts, is requested to send such information to the Superintendent of the Coast and Geodetic Survey, Washington, D. C.

NOTE 4.—This type of bench mark is a  $\frac{3}{8}$ -inch copper bolt, 2 inches long, set in lead or cement, flush with a horizontal or vertical surface. In the latter case, a horizontal mark cut on the face of the bolt, or the horizontal mark of a cross, is the bench mark.

NOTE 5.—This type of bench mark is the bottom of a hole in a horizontal surface, 25 millimeters square, 4 millimeters deep, lettered "U. S. B. M."

NOTE 6.—Where hydrants have been used as bench marks, the highest point is meant, a brass nut used as a check valve. These may not be considered stable points. They are, however, the most accurately defined of the city bench marks.

NOTE 7.—Bench marks referred to this note are upon a Coast and Geodetic Survey triangulation station mark or witness mark, a terra cotta pipe filled and surrounded with concrete, from which projects the point of a nail. The bench mark is a square hole cut near the nail.

NOTE 8.—This type of bench mark is the smooth bottom of a round cut, or shallow drill hole, 8 millimeters deep and 25 millimeters in diameter, in a horizontal stone surface.

NOTE 9.—Bench marks referred to this note are upon a Coast and Geodetic Survey triangulation station mark, a terra cotta pipe filled and surrounded with concrete, from which projects the point of a nail, against which the rod was held.

NOTE 10.—Bench marks referred to this note consist of a copper bolt in a bench mark stone, set 4 feet underground, covered by a 3-inch iron pipe marked "U. S. B. M."

NOTE 11.—The bottom of a hole 25 millimeters square and about 4 millimeters deep, cut in the top of a stone or cement post, 4 feet long and 6 or 7 inches square, projecting about 6 inches from the ground. The top of the post is lettered "U. S. B. M."

NOTE 12.—The top of a copper bolt cemented in the top of a 4-foot reinforced concrete post, 7 inches square, with edges beveled, projecting about 6 inches from the ground, with the top marked "U. S. B. M."

NOTE 13.—The surface within an outlined square, 1 inch on each side, on a horizontal surface of masonry, unlettered.

NOTE 14.—The surface within an outlined square, 1 inch on each side, on a horizontal surface of masonry, lettered "U. S."

NOTE 15.—The bottom of a hole in a horizontal surface, 25 millimeters square and 4 to 6 millimeters deep, lettered "U. S."

NOTE 16.—The bottom of a hole in a horizontal surface, 25 millimeters square, 4 millimeters deep, not lettered.

NOTE 17.—A 3-inch aluminum or bronze disk \* lettered "U. S. Geological Survey B. M. \$250 fine or imprisonment for disturbing this mark. Elevation above sea — feet. Datum —." Each disk is stamped with the approximate elevation in feet and a letter or letters to indicate the datum plane. This elevation and the datum letter or letters usually form the name by which the bench mark is designated in this publication.

NOTE 18.—This type of bench mark has the same lettering as that referred to in note 17, and is a 3-inch aluminum or bronze cap riveted upon a 3-inch iron pipe, set in the ground, 5 to 6 inches being exposed above the ground. A cross cut in the center of the top is the bench mark.

NOTE 19.—A bench mark referred to this note was established by the Corps of Engineers, U. S. Army. It is the top of a long section of iron rail driven in the center of the railroad track on the south jetty, Galveston, Tex.

NOTE 20.—A cross on the top of a section of rail set vertically in the ground. Those designated "M. M." (mile monument) mark the exact mile which is indicated by the numeral following; the others are designated "R. M." (rail monument).

NOTE 21.—A bench mark of the Baltimore and Ohio Railroad, being a section of rail, sometimes marked with a cross, set vertically between the tracks; when there are several tracks it is set between the main tracks.

NOTE 22.—A bench mark of the Baltimore and Ohio Railroad, consisting of a section of rail set vertically in the ground near the track. It is to the right, when proceeding from Warwick, Ohio, to Wheeling, W. Va.

\* See illustration on p. 550, Appendix 8, Report for 1899; also U. S. Geological Survey Report, 1896-97, Part I, pp. 226-228.



NOTE 23.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in an abutment of a bridge. It is in the right-hand end of the farther abutment, when proceeding from Cumberland, Md., toward Wheeling, W. Va.

NOTE 24.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt in the bridge seat of an abutment. It is in the right-hand end of the bridge seat of the farther abutment, when proceeding from Cumberland, Md., toward Wheeling, W. Va.

NOTE 25.—This type of bench mark is a square post of concrete made of Portland cement and fine gravel, of the grade called artificial stone, somewhat finer than that of which sidewalk blocks are made. It is 4 feet long, projecting 3 inches above the ground, 6 inches square at the base, and 4 inches square at the top, with a copper bolt set flush with the top surface, which is lettered "U. S. B. M."

NOTE 26.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in a culvert or bridge. It is in the farther end of the right-hand coping, when proceeding from Cumberland, Md., toward Wheeling, W. Va.

NOTE 27.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in rock in place, on the left-hand side of the track when proceeding from Cumberland, Md., toward Wheeling, W. Va.

NOTE 28.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in rock in place, on the right-hand side of the track when proceeding from Foley, Pa., toward Chicago Junction, Ohio.

NOTE 29.—A bench mark of the Baltimore and Ohio Railroad, consisting of a section of rail set vertically in the ground on the left-hand side of the track, when proceeding from Foley, Pa., toward Chicago Junction, Ohio.

NOTE 30.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in the end of the bridge seat of a bridge. When proceeding from Foley, Pa., toward Chicago Junction, Ohio, it is in the right-hand end of the nearer of the two abutments of the bridge.

NOTE 31.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in the end of the bridge seat of a bridge. When proceeding from Foley, Pa., toward Chicago Junction, Ohio, it is in the right-hand end of the farther of the two abutments of the bridge.

NOTE 32.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in an abutment of a bridge or culvert. It is on the right-hand end of the nearer abutment when proceeding from Foley, Pa., toward Chicago Junction, Ohio.

NOTE 33.—A bench mark of the Baltimore and Ohio Railroad, consisting of a copper bolt set in an abutment of a bridge or culvert. It is on the right-hand end of the farther abutment when proceeding from Foley, Pa., toward Chicago Junction, Ohio.

NOTE 34.—This type of bench mark is a stone post of Sioux quartzite, or so-called pink jasper, 4 feet long, set in the ground with 6 inches exposed, and this portion is rough dressed. The upper surface is 6 inches square, being marked in the center with a  $\frac{3}{8}$ -inch copper bolt, 2 inches long, set flush with the surface; the top of the bolt is the bench mark; the upper surface of the stone is lettered "U. S. B. M." and when the post is set near the railroad these letters face the track.

NOTE 35.—The bottom of a hole 1 inch square and about  $\frac{1}{4}$  inch deep, cut in the top of a reinforced concrete post, 4 feet long and 7 inches square, projecting about 6 inches above the ground. The top of the post is lettered "U. S. B. M."

NOTE 36.—This type of bench mark is a  $\frac{3}{8}$ -inch copper bolt, 2 inches long, set in lead or cement, flush with a horizontal or vertical surface, lettered "U. S." In the latter case, a horizontal mark on the face of the bolt is the bench mark.

NOTE 37.—A bench mark referred to this note was described by the Baltimore and Ohio Railroad as "a copper bolt set as described above in foundation for P. & L. E. R. R. signal bridge." The reference "as above" is to the description of B. & O. 359A, immediately preceding: "Copper bolt set in a concrete foundation of P. & L. E. R. R. signal bridge \* \* \* in the more easterly of two northern pedestals." In the original descriptions of all the Baltimore and Ohio Railroad bench marks the expressions "easterly," "northerly," etc., referred to the general direction of the railroad and not to the actual direction at the point.

NOTE 38.—These bench marks were set and located geodetically in winter of 1892-93, and their geographical positions are published in Report of 1893, pages 3608-3619.

The stone-line bench marks consist of a vitrified tile 18 by 18 by 4 inches. A copper bolt is leaded vertically in the center of this tile, the upper end projecting slightly above face of tile. On the surface of the tile surrounding the bolt is the inscription Mississippi River Commission.

U. S.

B.   M.

1893.

The tile is buried in the ground from 18 to 40 inches deep, the depth varying with the nature of the material.

On top of the tile a 4-inch wrought-iron gas pipe 4 feet long is set concentric with the copper bolt. The lower end of the pipe is expanded and fits in a circular groove molded in the tile. A cast-iron cap fits over the top of the pipe and is fastened thereto with bronze bolts. The top of the cap bears a similar inscription to that on the tile. (See Report of Chief of Engineers for 1894, Part 5, p. 2768.)

NOTE 39.—All bench-mark monuments referred to as pipestone benches consist of pieces of lime-

U S

stone 46 centimeters square and 15 centimeters thick, marked  with spherical-headed copper bolts

B M

leaded in upper faces and buried 1.2 meters under ground, access being given through 12-centimeter iron pipes set on top. Each pipe has a cast-iron cap, fastened by a horizontal bolt through cap and pipe.

USE

The cap has a small boss and the letters  raised on top. Elevations apply to the top of the bolt in

B M

the underground stone. Elevation of boss of pipe cap can be found in any case by adding 1.24 meters to elevation of copper bolt. (See Report of Chief of Engineers for 1902, Part 2, p. 1467.)

NOTE 40.—All bench-mark monuments referred to as pipe-flange benches consist of 4-centimeter gas pipes about 1.6 meters long, capped at upper end and having a 12-centimeter circular flange attached near lower end by lock nuts. Monuments set with about 0.1 meter above ground surface. Flanges are surrounded in the usual case by a matrix of neat cement, approximately doubling the bearing area of the monument. Elevations apply to the top of cap. (See Report of Chief of Engineers for 1902, Part 2, p. 1467.)

NOTE 41.—A permanent bench mark (P. B. M.) referred to this note consists of a  $\frac{3}{8}$ -inch copper bolt leaded vertically into the center of the dressed upper surface of a limestone block 18 inches square by about 6 inches thick. The bolt projects a little above the surface of the stone, on which are inscribed the words "Ill. River U. S. Survey 1903." This stone is set about 3.5 feet below the level of the ground, with its upper surface in a horizontal position. On the top of the stone so placed is set vertically and concentric with the copper bolt a 3-inch wrought-iron pipe, 4 feet long, split at the bottom, and expanded into two flat foot-like bases which rest on the stone and also serve to prevent the pipe from being pulled up. A nipple, having an external diameter equal to the internal diameter of the pipe and being of sufficient length to extend from the stone up into the pipe a short distance above the split, is placed at the bottom of the pipe to prevent the earth from closing around the copper bolt. A cast brass cap fits over the top of the pipe, to which it is riveted by two bolts at right angles to each other passing through the pipe and the flange of the cap. On the top of the cap is inscribed in sunken letters, "Illinois River Survey. \$250 fine for disturbing this mark. 1903. U.  S. Latitude . Longitude . Elevation above sea ." Two elevations are obtained for such benches—the elevation of the top of the copper bolt in the stone in the ground and the elevation of the center mark, between the letters "U" and "S," on the top of the cap. (See Document No. 263, House of Representatives, 59th Cong., 1st sess.)

NOTE 42.—A bench mark referred to this note is the highest point in a square cut in stone and marked thus:

U  S

NOTE 43.—A bench mark referred to this note consists of a copper bolt leaded vertically into stone, the top of the bolt being the bench mark. It is lettered thus:

U S

P B M

NOTE 44.—A bench mark referred to this note is the center of a cross (+) cut on the cross section or end of a piece of railway rail set vertically in the ground.

NOTE 45.—A bench mark referred to this note is the highest point in a square cut in a stone surface and marked:

S D  
□  
P B M

NOTE 46.—A bench mark referred to this note is center punch mark in the end of a copper bolt leaded into stone, and lettered:

S D  
○  
P B M

NOTE 47.—A bench mark referred to this note is similar to that described in note 46 except it is lettered "U. S. P. B. M." instead of "S. D. P. B. M."

NOTE 48.—The bench marks in the line Fort Adams to Vicksburg, 1905-6, were said to be "the regulation tile pipe and bronze cap used by the Mississippi River Commission for some years." They were therefore of the same type as those described in the Report of the Chief of Engineers for 1900, Part 7, as follows: "The new precise bench marks established on lines Biloxi, Miss., to New Orleans, La., and Baton Rouge, La., to Fort Adams, Miss., are of the B. M. form as used in 1898 above St. Paul, Minn., for ordinary bench marks, and consist of tile and pipe as follows: A vitrified tile 18 by 18 by 4 inches, in the center of which is set vertically with lead a three-eighths inch copper bolt, the upper end being a little above the upper surface of the tile. Surrounding the bolt on the surface of the tile is the inscription, 'Mississippi River Commission, 1898, U. S. B. M.' This tile is buried in the ground about 3 feet beneath the surface. On top the tile is placed a 4-inch wrought-iron gas pipe 4 feet long, concentric with copper bolt; the lower end of the pipe is split into quarters and spread out to prevent its being pulled up. A cast brass cap fits over the top of the pipe and is riveted thereto. The cap has the following inscription in sunken letters: 'Mississippi River Commission, \$250 fine for disturbing this mark, 1898, P. B. M. U. S., latitude □, longitude □, elevation above sea □.' The P is put on with a prick punch. The elevation of the top of the cap is determined; the structure has thus two bench marks."

NOTE 49.—A bench mark referred to in this note is the top of a copper bolt set vertically in the top of a truncated square pyramid of concrete built below the ground surface and surmounted by a square cast-iron cover with removable lid.

NOTE 50.—A 3-inch aluminum or bronze disk \* lettered "U. S. Geological Survey B. M. \$250 fine or imprisonment for disturbing this mark."

NOTE 51.—This type of bench mark is a 3-inch aluminum or bronze cap \* (lettered as in note 50) riveted upon a 3-inch iron pipe set in the ground.

#### DESCRIPTIONS OF ADDITIONAL PERMANENT BENCH MARKS ON ENGINEER LINES IN LOUISIANA, MISSISSIPPI, AND ARKANSAS.

[These descriptions are published in the Report of the Chief of Engineers for 1902, Part 2, and are republished here, only those changes being made which are necessary for indexing and for reference to the notes of types of bench marks.]

T. B. M. 11.—Near *Vicksburg, Warren Co., Miss.*; cross on head of 20d nail in S. chimney of Manuel Sweet's residence. Nail is 0.4 meter above ground. House stands at the junction of Yazoo and Old rivers.

T. B. M. 2.—Head of railroad spike driven horizontally in retaining wall just N. of St. Louis, Iron Mountain and Southern Ry. depot at *Little Rock, Pulaski Co., Ark.* Spike is at corner of wall adjoining depot, about 0.5 meter above railway platform, and projects 0.02 meter from wall.

B. M. 3 (Merrill, 1871).—On top projecting layer of brick on E. corner of court-house, *Alexandria, Rapides Parish, La.*

B. M. 4 (Merrill, 1871).—Top surface of lower iron plate of iron pedestal of SE. pillar of vestibule of river entrance of court-house, *Alexandria, Rapides Parish, La.*

T. B. M. 23=Δ362.—Near *Egg Bend Landing, Avoyelles Parish, La.*; nail in top of jar on James Adams's place, 4 meters from road and 48 meters from levee.

P. B. M. 79.—*Egg Bend Landing, La.*; destroyed.

\* See footnote on page 127.

M. R. C. B. M. 1 $\frac{1}{2}$ °.—A pipestone bench, on side of hedge on main road by side of levee, 1 100 meters S. of *Smithland, Pointe Coupee Parish, La.*, and 110 meters S. of house occupied by Simon Smith on George Bienvenue's place. (Note 39, p. 129.)

T. B. M. 72a.—Vicksburg, Shreveport and Pacific Railroad B. M.—Near *Ruston, Lincoln Parish, La.*; cross on steel rail 3 meters S. of center of track and 60 meters W. of milepost 104 from Delta.

Vicksburg, Shreveport and Pacific Railway B. M.—Near *Ruston, Lincoln Parish, La.*; cross on steel rail 3 meters S. of center of track and 200 meters from milepost 104 from Delta.

T. B. M. 91a.—Vicksburg, Shreveport and Pacific Railway B. M.—Near *Dubberly, Webster Parish, La.*; cross on steel rail 3 meters S. of track and 25 meters W. of bridge 294.

T. B. M. 116a.—Cross on anchor bolt on first pier at E. end of railway bridge at *Shreveport, La.*, and on S. side of bridge.

Mark for barometer.—Cross cut in stone sill of back door of post-office in public building in *Shreveport, Caddo Parish, La.*

Bayou Pierre B. M. 2.—Cross cut on lower course of stone of the top stones on S. side of west abutment of the Vicksburg, Shreveport and Pacific Ry. bridge at *Shreveport, La.*

T. B. M. 121.—Near *Curtis, Bossier Parish, La.*; cross on pipe of  $\Delta$  148 of Red River survey.

#### DESCRIPTIONS OF BENCH MARKS BETWEEN DELHI AND TENSAS RIVER, LOUISIANA, 1899.

[These descriptions are published in the Report of the Chief of Engineers for 1902, Part 2, pages 1505-1506, and are republished here, only those changes being made which are necessary for indexing and for reference to the notes of types of bench marks.]

P. B. M. 13.—*Delhi, La.* (See App. 8, Report for 1899, p. 676.)

T. B. M. 1.—On NE. corner of brick pier of NE. corner of S. Blum's store at *Delhi, Richland Parish, La.* Pier supports iron column at NE. corner of porch in front of store.

P. B. M. Griffin.—Pipe-flange bench on Jackson place near *Pullaway Landing, Franklin Parish, La.*, in W. corner of barn lot adjoining yard to plantation house owned by Tom Griffin. Is about 830 meters from mouth of Pullaway Bayou and near Jackson or Pullaway Landing. (Note 40, p. 129.)

P. R. P. Newcomer.—Pipe-flange bench at *Sunrise Landing, Franklin Parish, La.*, in NW. corner of lot adjoining front yard of J. L. Newcomer's residence, about 1.6 kilometers below Warsaw Landing, on Bayou Maçon. (Note 40, p. 129.)

P. B. M. Gray.—Pipe-flange bench on Gray place, near *Crowville, Madison Parish, La.*, in SW. corner of yard of house occupied by James McPherson. Bench is 44 meters back from right bank of Tensas River. (Note 40, p. 129.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN BARBIN AND ACME, LA., NEAR THE MOUTH OF THE BLACK RIVER, 1899.

[These descriptions were published in the Report of the Chief of Engineers for 1902, Part 2, page 1514, and are republished here, only those changes being made which are necessary for indexing and for reference to the notes of types of bench marks.]

P. B. M. White.—Near *Murray's Landing*, about 8 miles NE. of *Marksville, Avoyelles Parish, La.*, and about 6 miles E. of *Vick*; pipe-flange bench in NW. corner of yard to residence of Mr. John White, 1 kilometer below lower end of Saline Point. Bench is 33 meters from R. B. of Red River, 8 meters W. from W. end of house, and 11 meters N. of N. line of porch on N. side (front) of house. (Note 40, p. 129.)

P. B. M. Barbin.—Pipe-flange bench in the back downstream corner of yard to residence at *Barbin Landing, Avoyelles Parish, La.*, 17 meters S. of gate in E. fence of yard and 40 meters SW. of SW. corner of warehouse. (Note 40, p. 129.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN GILBERT AND NEW LIGHT, LA., 1899.

[These descriptions were published in the Report of the Chief of Engineers for 1902, Part 2, pages 1511-1512, and are republished here, only those changes being made which are necessary for indexing and for reference to the notes of types of bench marks.]

P. B. M. Gilbert.—*Gilbert, Franklin Parish, La.* (See App. 8, Report for 1899, p. 680.)

P. R. P. Osborne.—Pipe-flange bench in NE. corner of front yard to residence of W. R. Osborne, at *Osbornes Ferry*, on Bayou Maçon, *Franklin Parish, La.* Bench is 21 meters from R. B. of bayou. (Note 40, p. 129.)

P. B. M. New Light.—Pipe-flange bench in the NE. corner of James R. Lynch's front yard, at *New Light, Tensas Parish, La.*, and 10 meters back from L. B. of Tensas River. (Note 40, p. 129.)

## DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN ARCHIBALD AND COLUMBIA, LA., 1899.

[These descriptions were published in the Report of the Chief of Engineers for 1902, Part 2, pages 1508-1511, and are republished here, only those changes being made which are necessary for indexing and for reference to the notes of types of bench marks.]

P. B. M. Archibald.—*Archibald, Richland Parish, La.* (See App. 8, Report for 1899, p. 679.)

P. R. P. Alto.—Pipe-flange bench at *Alto, Richland Parish, La.*, in SW. corner of yard of E. H. Cook, on N. side of Archibald road and 20 meters E. of L. B. of Boeuf River. (Note 40, p. 129.)

P. B. M. Harland.—Pipe-flange bench at NW. corner of store at Harland Field, near *Charlottesville, Richland Parish, La.*, 20 meters from bank of Boeuf River and 75 meters above point where second bank joins main bank. (Note 40, p. 129.)

P. A. P. Stokes.—Pipe-flange bench on Stokes place, opposite *Charlottesville, Richland Parish, La.*, 40 meters from R. B. of Boeuf River, 25 meters from cabin, and 150 meters below Stokes's residence. (Note 40, p. 129.)

P. R. P. Stokes.—Pipe-flange bench on Stokes place, near *Charlottesville, Richland Parish, La.*, on R. B. of Boeuf River, 18 meters from main top bank and 20 meters upstream from cabin occupied by Henry Hunter. (Note 40, p. 129.)

P. R. P. Hatch.—Pipe-flange bench at *Holly Grove Ldg., Richland Parish, La.*, in NW. corner of yard in front of Frank Hatch's residence, 60 meters NW. from residence, 100 meters E. from landing, and 20 meters from L. B. of Boeuf River. (Note 40, p. 129.)

P. R. P. Noble 2.—Pipe-flange bench on property of C. M. Noble, near *Holly Grove, Richland Parish, La.* It is 40 meters from L. B. of Boeuf River, in corner of pasture where road from Holly Grove Ldg. turns down L. B. of river after crossing neck of first bend below Holly Grove. (Note 40, p. 129.)

P. R. P. Elmore.—In *Richland Parish*, near *Landerneau, Caldwell Parish, La.* Pipe-flange bench on property of Elmore and King, 400 meters below cabin on Thomason place, Richland Parish, La., 5 meters W. of road cutting across neck from Thomason place to Landerneau and 90 meters from L. B. of Boeuf River. (Note 40, p. 129.)

P. R. P. Doucier.—Pipe-flange bench on property of the "Green Grove" Church, opposite *Landerneau*, and in *Richland Parish, La.* It is on the E. side of road crossing neck, 40 meters E. of E. wall of church, extended, and 15 meters S. of S. wall, extended. (Note 40, p. 129.)

P. R. P. Harris.—Pipe-flange bench on Harris place, 300 meters above Bird Lake Landing, near *Boeuf River, Caldwell Parish, La.* It is 3 meters W. of road, on field side of fence, 10 meters below angle, 100 meters above SW. corner of field, and 40 meters from bank of Boeuf River. (Note 40, p. 129.)

P. R. P. Wheeler.—Pipe-flange bench at old Doucier Landing, on Paul Brandin's place, near *Boeuf River, Caldwell Parish, La.*, 12 meters from R. B. of Boeuf River, 300 meters below where road crossing neck from the old Doucier place reaches river. (Note 40, p. 129.)

P. R. P. Hebert.—Pipe-flange bench 250 meters above Heberts Landing, near *Boeuf River, Caldwell Parish, La.*, in NW. corner of garden back of house of Widow Johnson, 16 meters from R. B. of Boeuf River and 60 meters below a deep gully entering river. (Note 40, p. 129.)

P. R. P. La Fourche.—Pipe-flange bench, 400 meters SW. of Heberts Landing, near *Boeuf River, Caldwell Parish, La.*, in SE. corner of field on Hebert's place and on W. side of road to Columbia, which crosses neck from Boeuf River to Bayou La Fourche. Bench is on top bank of Bayou La Fourche. (Note 40, p. 129.)

P. R. P. Columbia.—Pipe-flange bench about 2.4 kilometers below and opposite *Columbia*, and in *Caldwell Parish, La.*, 7 meters N. of fence forming S. boundary, and 210 meters W. of fence forming E. boundary of I. Davis's place. (Note 40, p. 129.)

P. R. P. Wade.—Pipe-flange bench on Wade place, near *Columbia, Caldwell Parish, La.*, 5 meters below cabin occupied by Henry Neil (1896) and on line with posts of front gallery, 15 meters E. from road, 58 meters from L. B. of river, 50 meters S. of lane, and 150 meters below steam gin. (Note 40, p. 129.)

P. R. P. Three Rivers.—Near *Columbia, Caldwell Parish, La.* Pipe-flange bench at the Boeuf River crossing of road to Columbia from Winnsboro. Bench is in grove of small pecans, 30 meters W. of R. B. of Boeuf River, 25 meters W. of stretch of road paralleling river, 25 meters N. of an E. and W. stretch in road, and 75 meters below lower end of small island in river. (Note 40, p. 129.)

## DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN CAMDEN, ARK., AND SHREVEPORT, LA.

These descriptions were published in the Report of the Chief of Engineers for 1902, Part 2, pages 1479-1484, and are republished here. Usually only those changes are made which are necessary for indexing, and for reference to the notes of types of bench marks.]

P. B. M. Camden IV.—*Camden, Ouachita Co., Ark.* (See App. 8, Report for 1899, p. 686.)

P. B. M. Camden III.—*Camden, Ouachita Co., Ark.* (See App. 8, Report for 1899, p. 686.)

H. S. 287.—Described by U. S. Engineers as "A standard bench of the Geological Survey at *Buena Vista, Ouachita County, Ark.* Is 35 meters W. of the NW. corner of depot, and in corner formed by post-office building and fence around adjoining yard." Described by the United States Geological Survey in Annual Report No. 21, Part 1, page 478, as "Opposite station, about 75 feet south of main track of St. Louis Southwestern Ry., in front of residence of Mrs. Martha E. Sifford; iron post, marked 'H. S. 287.'" (Note 18, p. 127.)

P. B. M. Buena Vista.—Pipestone bench at *Buena Vista, Ouachita County, Ark.* It is 9 meters W. of main track and 110 meters S. of SE. corner of depot. (Note 39, p. 129.)

R. R. B. M.—On a 0.4-meter sweet gum 20 meters W. of track, 130 meters S. of trestle 853, and about 1 kilometer below *Ogamaw, Ouachita County, Ark.* The tree has the letters U S cut on it. It is the higher one of two spikes on the same tree.

P. B. M. Stephens.—Pipestone bench at *Stephens, Ouachita County, Ark.* In NE. corner of yard to hotel belonging to Mrs. S. Boggs, 25 meters W. of St. Louis Southwestern Ry. track, 25 meters from corner of hotel, 24 meters from corner of gin, and 78 meters from corner of depot. (Note 39, p. 129.)

R. R. B. M.—Near *Stephens, Ouachita Co., Ark.* In root of a 0.4-meter holly 15 meters from L. B. of Smackover Creek, 20 meters S. of track, on a line even with beginning of trestle over creek. The letters U S are cut on tree. It is the higher one of two spikes on the same tree.

P. B. M. McNeil.—Pipestone bench at *McNeil, Columbia County, Ark.* On E. side of cattle pen at the NE. corner, 28 meters S. from the main track of the St. Louis Southwestern Ry., 11½ meters from the corner of transfer shed and about 170 meters from depot. (Note 39, p. 129.)

P. B. M. Waldo.—Pipestone bench at *Waldo, Columbia County, Ark.* At S. edge of the St. Louis Southwestern Ry. right of way, 48 meters from track, 60 meters from switch at end of siding, and 270 meters E. from depot. (Note 39, p. 129.)

R. R. B. M.—Near *Buckner, Columbia Co., Ark.* A railroad spike in a 0.4-meter post oak, 20 meters S. of track at a point 40 meters W. of T. B. M. 232, which is described as a boat spike in root of a 0.3-meter water oak, 25 meters N. of track, 90 meters W. of trestle over Bayou D'Orcheat, 70 meters W. of sign reading "Station, 1 mile." (Referring to *Buckner*.) The letters U S are cut on tree above bench.

P. B. M. Stamp.—Pipestone bench at *Stamps, Lafayette County, Ark.* It is in the NE. corner of lot inclosing offices and buildings of the Louisiana and Arkansas R. R., 38 meters N. of main track of the St. Louis Southwestern Ry. and about 50 meters from depot. (Note 39, p. 129.)

P. B. M. Lewisville.—Pipestone bench at *New Lewisville, Lafayette County, Ark.* At E. corner of cattle pen, 28 meters E. of main track of St. Louis Southwestern Ry., 90 meters SW. from depot. (Note 39, p. 129.)

T. B. M. 239.—*Lewisville, Lafayette Co., Ark.* Cross chiseled on head of boiler rivet holding two sheets of sheet iron resting on stone foundation pier for water tank at junction of Shreveport branch with main line of St. Louis Southwestern Ry. Bench is on pier next to main track and toward Lewisville and on the SW. corner of sheet-iron plate.

P. B. M. Garland.—Pipestone bench at *Garland, Miller County, Ark.* On R. B. of Red River, 100 meters NW. of pier approach to railway drawbridge, 24 meters W. of main track and about 500 meters S. of depot. (Note 39, p. 129.)

B. M. 4. (Red River survey).—Pipestone bench at *Garland, Miller County, Ark.*, at NW. corner of St. Louis Southwestern Ry. section house. It is 2 020 feet from center pier of railway drawbridge and 70 feet N. of track. (Note 39, p. 129.)

P. B. M. Jordan.—Pipestone bench about 150 meters E. of L. B. of Red River at *Jordan Ferry, Lafayette County, Ark.*, at edge of road 3 meters S. of Terrell Bayou and on Ward place. (Note 39, p. 129.)

P. R. P. 14 (Red River survey).—Pipestone bench on L. B. of Red River about 800 feet back of *Jordan Ldg., Lafayette County, Ark.*, and 500 feet S. of Terrell Bayou at angle in levee between the Terrell and Dixon plantations. (Note 39, p. 129.)

P. B. M. Canfield.—Pipestone bench at *Canfield, Lafayette County, Ark.* Is 2.7 meters from SW. corner of cattle pen, 19 meters W. of main track, and 95 meters NW. of corner of depot of the St. Louis Southwestern Ry. (Note 39, p. 129.)

P. B. M. Bradley.—Pipestone bench at *Bradley, Lafayette County, Ark.* At NW. corner of depot, 13 meters W. of main track of the St. Louis Southwestern Ry. (Note 39, p. 129.)

P. B. M. Lusk.—Pipestone bench at *Millers Bluff, about 7 miles W. of Plain Dealing, Bossier Parish, La.* In the SW. corner of yard of Jake Lusk, 5 meters N. of road and 400 meters from bank of Red River at Lusk's Ferry and on edge of crest of hills known as Millers Bluff. (Note 39, p. 129.)

P. R. P. 25 (Red River survey).—Near *Millers Bluff, about 8 miles W. of Plain Dealing, Bossier Parish, La.* Pipestone bench. Is 250 feet from L. B. of Red River and 160 feet below Posten Bayou near mouth. (Note 39, p. 129.)

P. B. M. Plain Dealing.—Pipestone bench at *Plain Dealing, Bossier Parish, La.* Is 100 meters N. of depot, 18 meters W. of St. Louis Southwestern Ry. track at a point 10 meters S. of point of curvature. (Note 39, p. 129.)

P. B. M. Alden Bridge.—Pipestone bench at *Alden Bridge, Bossier Parish, La.* On NE. side of yard, 3.6 meters from hotel building, 80 meters W. of main track of the St. Louis Southwestern Ry. at a point 125 meters NE. of depot. (Note 39, p. 129.)

P. B. M. Hurricane Bluff.—Pipestone bench at *Hurricane Bluff, about 4 miles from Benton, Bossier Parish, La.* Is 70 meters from L. B. of Red River and in yard to residence of Walter Ivory, 20 meters from road to Hurricane Bluff Ferry. (Note 39, p. 129.)

P. R. P. 30 C.—About 4 miles west of *Benton, Bossier Parish, La.*; top of boss to standard B. M. pipe (no stone). Bench is 1 650 feet from river and 1 000 feet above mouth of small bayou at *Hurricane Bluff, Bossier Parish, La.*

P. B. M. Benton.—Pipestone bench at *Benton, Bossier Parish, La.*, in NE. corner of section-house yard. (Note 39, p. 129.)

T. B. M. 274.—Near *Vanceville, Bossier Parish, La.*; cross cut on third brick of second offset course from NW. corner of brick chimney to a deserted cabin, 60 meters W. of track,  $3\frac{1}{2}$  telegraph poles N. of milepost 443. Plantation road crosses track and runs in front of bench. The letters "U S" are cut in the course of brick just above bench.

P. R. P. 32 (Red River survey).—Near *Vanceville, Bossier Parish, La.*; pipestone bench on plantation of T. J. Vance, in front of plantation house, and on top of levee about 420 feet above Benoit Bayou. (Note 39, p. 129.)

P. B. M. 45.—Near *Shreveport, Caddo Parish, La.* (See App. 8, Report for 1899, p. 670.) In the Report of the Chief of Engineers for 1902, Part 2, page 1484, the B. M. is described as a *pipestone* bench mark (note 39, p. 129), "200 meters from the Bossier end of Vicksburg, Shreveport and Pacific bridge over Red River, 30 meters SE. of track. Bench is covered by SW. slope of levee and is marked by a post set over a bench and painted white. 'Post is marked P. B. M. 45.'" This is probably the post which was reported loose in 1902.

B. M. "B. P." (Not Bayou Pierre survey B. M. 2).—Is + cut on top capstone of retaining wall on SW. side of Vicksburg, Shreveport and Pacific Ry. bridge at *Shreveport, Caddo Parish, La.*

P. B. M. 46.—*Shreveport, Caddo Parish, La.* (See App. 8, Report for 1899, p. 670.)

#### DESCRIPTIONS OF STONE-LINE BENCH MARKS, NEW ORLEANS TO BATON ROUGE, LA.\*

[These descriptions are published in the Report of the Chief of Engineers for 1894, Part 5, pages 2769-2776, and are republished here. Usually only those changes are made which are necessary for indexing and for reference to the note of types of bench marks. The elevations of these B. Ms. were determined in 1897-98.]

<sup>21</sup>/<sub>5</sub>.—*New Orleans, Orleans Parish, La.*, on NE. corner of Forstall and Villers streets, back of New Orleans and Southern R. R., and at SW. corner of Mr. Boman's land; just outside of fence corner and between fence and ditch; 346.2 meters back of railway. (Note 38, p. 128.)

<sup>21</sup>/<sub>2</sub> A.—Cap over <sup>21</sup>/<sub>5</sub>.

<sup>21</sup>/<sub>1</sub>.—*Carrollton, Jefferson Parish, La.*, on line of fence running back from Steamship Exchange saloon, 50 meters above Illinois Central R. R. tracks and Southport elevator; pasture on upper side, lower side cultivated. (Note 38, p. 128.)

\* For other bench marks along this line, see Appendix 3, Report for 1903, pp. 607-612.

<sup>292</sup>.—One-fourth mile above landing at *Kenner, Jefferson Parish, La.*, in lane leading to swamp,  $\frac{1}{2}$  meter E. of W. fence of lane, 2 meters S. of an E. and W. ditch which crosses lane, about 150 meters S. of line of timber. Lane is the one 27 meters W. of B. M. <sup>292</sup> and runs N. and S. (Note 38, p. 128.) B. M. <sup>292</sup> was not recovered in 1897-98, but was described in the 1894 Report as back of fence, back of road, back of levee, in upper part of *Kennerville*, 27 meters below first street in upper part of town. House occupied by E. Stahl (white) is on opposite corner. Bench mark is just below a prominent bend in levee, 50 meters above house occupied by Walter Davis (colored).

<sup>297</sup>.—About  $\frac{1}{4}$  mile below landing on *Patterson plantation, St. Charles Parish, La.*, on right of way of Louisville, New Orleans and Texas R. R., 15 rail lengths above a road crossing, on upper side of third ditch above road; 17 rail lengths below milepost "14;" 10 rail lengths below levee on line between plantations of Patterson and Rose; 400 meters W. of old *Almadia* sugarhouse. (Note 38, p. 128.)

<sup>298</sup>.—About  $\frac{1}{4}$  mile above old incline of Texas and Pacific R. R., on *Pecan Grove plantation, St. Charles Parish, La.*, on right of way of Louisville, New Orleans and Texas R. R., 7 meters in front of track, 125 rail lengths below milepost 17, 48 rail lengths below upperswitch to siding. (Note 38, p. 128.)

<sup>299</sup>.—About  $\frac{1}{4}$  mile below government light on *Good Hope plantation*, near line between *Good Hope* and *Prospect* plantations, *St. Charles Parish, La.*, on Louisville, New Orleans and Texas R. R. right of way, on line of front row of telegraph poles, 32 rail lengths below *Sarpy* station;  $4\frac{3}{4}$  rail lengths below lower switch stand, 6 meters in front of track; between the fifth and sixth ditch below the lower section house; at fifth telegraph pole below telegraph station. (Note 38, p. 128.)

<sup>301</sup>.—About  $\frac{1}{4}$  mile above depot at *La Place, St. John the Baptist Parish, La.*, on *Montague plantation*, on river side of road almost in front of *Montague's* house, 75 meters above junction of roads, also *Montague's* store. (Note 38, p. 128.)

<sup>302</sup>.—About  $\frac{3}{4}$  mile below *St. Peter's Church*, at *St. Peters, St. John the Baptist Parish, La.*, on land owned by *Nicaise Mader*, 7 meters N. of live-oak tree, 30 inches in diameter. Live oak is between two ditches. B. M. is on upper bank of upper ditch and 100 meters N. of E. and W. fence between pasture and rice field. (Note 38, p. 128.)

<sup>302</sup>.—Near *Garyville, St. John the Baptist Parish, La.*, 6 meters in front of Louisville, New Orleans and Texas R. R. beside road;  $30\frac{1}{2}$  rail lengths below milepost "36 mi. to N. O.;" on property of *Valsin Oubree* (colored), 10 meters above line of canal between *Oubree's* and *Union* plantations; 10 meters below road running back from B. M. <sup>302</sup> across railroad. (Note 38, p. 128.) B. M. <sup>302</sup> was not recovered in 1897-98. It was described in the 1894 Report as 1109.7 meters from <sup>302</sup> on property of *Valsin Oubree*, 40 meters below *Four Seasons* store, owned by *Geauguard*, and below square-topped house occupied by *Altore Montz*.

<sup>307</sup>.—Near *Lutcher, St. James Parish, La.*, on *Golden Grove plantation*, 417 meters back of Louisville, New Orleans and Texas R. R.; back of and on embankment of canal, which runs directly from *Thompson* sugarhouse, which is 700 meters above; 157 meters directly W. from junction of road from *Golden Grove* sugarhouse and road running NW.; 60 meters above road running NW. (Note 38, p. 128.)

<sup>308</sup>.—Near *Lutcher, St. James Parish, La.*, on *Bellevue plantation*, 7 meters back of Louisville, New Orleans and Texas R. R.; 25 rail lengths below milepost "44 miles to N. O.;" 10 rail lengths above road crossing and also culvert No. 787; on upper side of third ditch above road. (Note 38, p. 128.)

<sup>309</sup>.—Near *Hester, St. James Parish, La.*,  $\frac{1}{2}$  meter back of fence which runs back of road inside of new levee. It stands 16 meters above fourth ditch, above residence grounds of plantation, and is 340 meters above plantation sugarhouse; on *Hester (Belle Alliance)* plantation. (Note 38, p. 128.) Distance between <sup>309</sup> and <sup>309</sup> is 975.3 meters. <sup>309</sup> was not recovered in 1897-98, but was described in the 1894 Report as on *Belle Alliance* plantation, owned by J. C. Ross, of New Orleans. Stone is on high embankment, back of canal running E. and W. on line between church back of quarters and *Belmont* sugarhouse; 288 meters above first road above *Ross* residence, running back from river; on same canal that telephone line is on.

<sup>314</sup>.—About  $\frac{3}{4}$  mile below *College Landing*, at *College Point, St. James Parish, La.*, back of road, back of levee on property of *Noel Mather* (colored), 10 meters below line of fence between *Mather* and *Adolph Feuran* (colored), 58 meters SW. of *Mather's* house, 66 meters SW. of new *Sunrise* Store, 40 meters S. of *Adolph Feuran's* house,  $\frac{1}{2}$  mile below 60-mile post to New Orleans. (Note 38, p. 128.) <sup>314</sup> is 744.3 meters from <sup>314</sup>, which is *College* triangulation station. <sup>314</sup> was not recovered in 1897-98, but was described in the 1894 Report as 20 meters E. of W. boundary line of college property; 15 meters back of a short cross fence, in low, wet ground covered with cottonwood timber.



<sup>122</sup>.—About  $\frac{1}{4}$  mile above Lily store and landing, *St. James Parish, La.*, on *Celestine plantation*, property of Felician Ory. It is 48 meters back of Louisville, New Orleans and Texas R. R.,  $14\frac{1}{2}$  rail lengths below milepost "52 miles to N. O.;" on upper bank of second ditch above road leading from river to sugarhouse. (Note 38, p. 128.)

<sup>121</sup>.—On *Alta Vela plantation*, near *Whitehall, St. James Parish, La.*, on Louisville, New Orleans and Texas R. R. right of way, between main track and siding;  $57\frac{1}{2}$  rail lengths below *Whitehall station*; 20 rail lengths above lower end of switch at an old road crossing. (Note 38, p. 128.)

<sup>120</sup>.—About 800 meters below *Miles, St. James Parish, La.*,  $\frac{1}{4}$  mile below landing on *Bagatelle plantation*,  $\frac{1}{2}$  mile above Union post-office; on *St. Mary plantation*, 28 meters below line between *Bagatelle* and *St. Mary plantations*, on line of Louisville, New Orleans and Texas R. R. It is  $17\frac{3}{4}$  rail lengths below milepost "58 miles to N. O. and 397 miles to Memphis," on the upper side of first ditch below boundary line. (Note 38, p. 128.) An 18-inch sycamore tree 30 meters, N.  $60^{\circ}$  W. is blazed with a triangle.

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN FORT ADAMS AND VICKSBURG, MISS., 1905-6.

[These descriptions were furnished by the Chief of Engineers in the form of a copy of the manuscript for publication and are here reprinted without change, except the reference to note 48 and the addition of the name of a town, with the county and State, to each description, for the purpose of indexing.]

P. B. M. Point Breeze.—On *Point Breeze, Concordia Parish, La.* (See App. 3, Report for 1903, p. 621.)

P. B. M. XLVIII.—*Fort Adams, Wilkinson Co., Miss.* (See App. 3, Report for 1903, p. 621.)

P. B. M. Fort Adams.—*Fort Adams, Wilkinson Co., Miss.* (See App. 3, Report for 1903, p. 621.)

P. B. M. XLIX.—*Fort Adams, Wilkinson Co., Miss.* (See App. 3, Report for 1903, p. 621.)

P. B. M. Knox.—Near *Nocks, Concordia Parish, La.*; tile and pipe set  $2\frac{1}{2}$  meters SE. of NE. corner of front gallery of cabin occupied by W. E. Wheat, on land of A. W. Reagan, 13 meters back of new levee, back of and a little above the cotton gin at Knox Ldg., La. The pipe is about in line of front line of gallery. (Note 48, p. 130.)

P. B. M. Ballymagan.—Near *Black Hawk, Concordia Parish, La.*; tile and pipe set in NE. corner of yard surrounding house of A. D. Kirby, overseer for George Scott's Ballymagan plantation, about  $3\frac{1}{4}$  miles below *Black Hawk Ldg., La.* It is 2 feet from either fence. (Note 48, p. 130.)

T. B. M. 13.—Near *Black Hawk, Concordia Parish, La.*; top of 40d boat spike driven vertically into bench cut on SE. root of a 20-inch chinaberry tree standing in road between levee and fence, 3 meters below lower end of cabin occupied by Lee Kenny (colored), on the Ballymagan plantation,  $1\frac{3}{4}$  miles along levee below *Black Hawk Ldg., La.* It is 150 meters below where B. M. <sup>121</sup> should be, the pipe being dug up, and levee built over stone.

T. B. M. 14.—Near *Black Hawk, Concordia Parish, La.*; top of 30d wire nail driven vertically into bench cut on E. root of a 3-foot chinaberry tree standing in road 5 meters back of levee, and 20 meters above negro church standing just outside of levee on *Black Hawk plantation*,  $\frac{3}{4}$  mile below *Black Hawk Ldg., La.*, and a short distance below *Black Hawk depot* on the R. R.

LIII (C. & G. S.).—Near *Black Hawk, Concordia Parish, La.*; bottom of square cavity cut in top of granite post buried in the ground to the right of the steps leading to the E. entrance of Mr. George Scott's residence on *Black Hawk plantation*,  $\frac{1}{4}$  mile above the present *Black Hawk Ldg., La.*, which is at the cotton gin on the river bank. Top of stone is about 3 inches above ground.

T. B. M. 15.—Near *Black Hawk, Concordia Parish, La.*; top of 30d wire nail driven vertically into bench cut on W. root of a 4-foot pecan tree standing just outside of levee, immediately in front of residence of A. J. McCleary, and immediately above his store. It is  $\frac{3}{4}$  mile below Grand Cut-off.

T. B. M. 17.—Near *Black Hawk, Concordia Parish, La.*; top of spike driven vertically into bench cut on root on road side of a 30-inch pecan tree standing just outside of fence at small angle in same, and 8 meters back of levee. It is 80 meters below small house of W. L. Shaw, occupied by M. Rothchild, and 70 meters above store of Rothchild & Co. It is 160 meters above Grand Cut-off and about 200 meters above a point opposite Shaw station on the R. R.

P. B. M. Union Point.—Near *Black Hawk, Concordia Parish, La.*; tile and pipe set in SE. corner of yard surrounding house of Tyler Watson on property of Benjamin Newgrass, about  $\frac{3}{4}$  mile below *Union Point Ldg., La.* It is 50 meters below *Union Point gin*, back of road and slough. It is  $2\frac{1}{2}$  feet from either fence. (Note 48, p. 130.)

B. M.  $1\frac{1}{2}^2$ .—Near *Bougere, Concordia Parish, La.*; stone post standing 1 meter N. of fence on S. side of road, 1 000 meters above Bougere Ldg., and P. O., La. It is 310 meters below a negro church. A 24-inch and a 30-inch pecan tree stand on opposite or N. side of road, the first below the stone, the other above and distant 36 and 40 meters, respectively. Both trees blazed with triangle facing stone.

LIV (C. & G. S.).—Near *Bougere, Concordia Parish, La.*; bottom of square cavity cut in top of granite post buried in the ground on the left of the steps leading to the front entrance of residence of Mr. Charles Johnson, agent of Mr. Learned, of Natchez, Miss., on the Ashland plantation. It is 1 mile above Bougere Ldg., and P. O., La. Top of stone is 2 inches above ground. It stands about midway between the steps and the W. end of the gallery.

T. B. M. 31.—Near *Fairview, Concordia Parish, La.*; top of 40d boat spike driven vertically into bench cut on N. root of a 16-inch pecan tree standing at the N. edge of road, 50 meters S. of levee, and 63 meters below, or W. of B. M.  $1\frac{1}{2}^1$ . Tree bears a blazed triangle facing the B. M.

New B. M.  $1\frac{1}{2}^1$ .—Near *Fairview, Concordia Parish, La.*; tile and pipe in position of stone whose top was broken off, on Excelsior plantation, back of Fritz Island, 90 meters back of low ground which formerly was a chute. It is 47 meters S. of levee, 2 meters S. of center of road and in edge of cotton field, and opposite a large burnt snag standing at base of levee. Another large snag stands 25 meters above pipe. Pipe is 199 meters above cabin occupied by Maggie Meyers (colored), 213 meters below cabin occupied by Sam Gains (colored), both standing between road and levee. It is 260 meters below cross fence, at road which leads across slough toward river. See T. B. M. 31 for witness tree.

T. B. M. 32.—Near *Fairview, Concordia Parish, La.*; top of boat spike driven vertically into bench cut on root on levee side of a 36-inch sycamore tree standing 3 meters outside of levee, on property belonging to the Excelsior plantation, about  $2\frac{1}{2}$  miles below Fairview Ldg., La., and  $1\frac{1}{4}$  miles below Fairview P. O., La. It is 60 meters above a road that crosses levee and leads to Excelsior store.

T. B. M. 35.—Near *Arnot, Wilkinson Co., Miss.*; top of 30d boat spike driven vertically into bench cut on S. root of a 36-inch oak tree standing on N. side of lane, 286 meters back of Kindling Altar Church (colored), on L. B. of river, a little below middle of Dead Man's Bend. It is 9 meters W. of P. B. M. Kindling. Wire fence is nailed to S. side of this tree, tree in field and S. root in lane.

P. B. M. Kindling.—Near *Arnot, Wilkinson Co., Miss.*; tile and pipe standing on L. B. of river, among some trees at back edge of field on land of Mrs. Margaret Winchester,  $1\frac{1}{2}$  meters N. of N. fence of lane leading back from the river past the Kindling Altar Baptist Church (colored), which stands on N. side of lane on land of M. Rothchild, of Kienstra, La. It is a little below Gaines Ldg., a little below the middle of Dead Man's Bend. It is 9 meters back of tree bearing T. B. M. 35, 295 meters back of the church, and 414 meters back of L. B. of river. A 12-inch gum tree standing just N. of fence is 3 meters W. of pipe, an 18-inch hackberry stands NNE. 3 meters, a 15-inch gum stands ENE. 3 (?) meters; all blazed with a triangle facing pipe. (Note 48, p. 130.)

T. B. M. 36.—Near *Fairview, Concordia Parish, La.*; top of boat spike driven vertically into bench cut on root on levee side of a 4-foot pecan tree which bears H. W. gauge No. 54, which is on R. B. about center N. and S. of Point Pleasant plantation,  $1\frac{1}{2}$  miles below Fairview Ldg., La. It is  $\frac{1}{2}$  mile below stone line No. 140. It is about 50 meters below several brick tombs in graveyard back of levee at 3 cedar trees.

B. M.  $1\frac{1}{2}^2$ —Obers Triangulation Station.—Near *Fairview, Concordia Parish, La.*; highest point on stone post, standing in grass, 6 inches above ground, about 15 meters back of top of main R. B. of river, about 150 meters outside of levee, 325 meters below hedge fence dividing the Roseland and Point Pleasant plantations. It is about 1 mile below Fairview Ldg., La. It is  $350^{\circ} 05'$ —1 180 meters from Roseland gin.

T. B. M. 38.—Near *Fairview, Concordia Parish, La.*; top of boat spike driven vertically in top of stump of 6-inch willow, standing at outer base of levee, and 8 meters above large ramp where road crosses levee, 15 meters above hedge which divides the Roseland and Fairview plantations.

P. B. M. Jones.—Near *Fairview, Concordia Parish, La.*; tile and pipe standing 1 meter from either fence in SE. corner of yard around cabin of Richard Jones (colored), agent for Mr. C. B. De Long, of Fithian, Ill. It is on Promised Land plantation, or Glasscock Swamp, on R. B. of river, 73 meters back of base of levee. It is about opposite or 400 meters back of H. W. gauge No. 55, which is a little below Boyds Ldg., La., and opposite lower half of Glasscock Island. (Note 48, p. 130.)

T. B. M. 42.—Near *Fish Pond, Concordia Parish, La.*; top of 30d boat spike driven vertically in 5-inch stump of SE. limb of a 12-inch cottonwood stump standing at fence back of levee, and about 75 meters below corner of field, which corner is at base of levee. T. B. M. is about 20 meters back of levee and about 800 meters above P. B. M. Jones.

P. B. M. Fish Pond.—Near *Fish Pond, Concordia Parish, La.*; tile and pipe at inner base of new levee, 2 meters below base of ramp where road crosses levee from Fish Pond Ldg., La., to Fish Pond station on Port Allen Branch of T. & P. R. R. It is on the property of D. H. Breton,  $\frac{1}{2}$  mile back of and a little above the landing. It is 450 meters toward river from station on R. R., and 58 meters above a prominent slough. (Note 48, p. 130.)

T. B. M. 50.—Near *Fish Pond, Concordia Parish, La.*; top of 30d boat spike driven vertically into top of 12-inch osage orange stump, 1 meter S. of S. tree in hedge, 8 meters back of base of new levee, and 1 meter N. of P. B. M. Hedge. The hedge runs back from the river at the old Lehmann store just above Greens Ldg., La.

P. B. M. Hedge.—Near *Fish Pond, Concordia Parish, La.*; tile and pipe set 2 meters S. of S. end of hedge, 7 meters N. or back of base of new levee. Said hedge, etc., see T. B. M. 50, above. (Note 48, p. 130.)

B. M.  $1\frac{3}{4}$ .—Near *Morville, Concordia Parish, La.*; stone post (leaning) on inner slope of levee, about  $\frac{1}{2}$  up from base, rod was held on cut on E. side of top of stone. It is in front of Ashley plantation, owned by S. B. Yeager, 100 meters above large barn and 50 meters above house occupied by William Smith. It is 390 meters above junction of levees where old levee continues southeasterly to the top of the main bank. It is 553 meters below a prominent angle in levee, and  $1\frac{1}{2}$  miles below Morville Ldg., La.

P. B. M. Yeager.—Near *Morville, Concordia Parish, La.*; tile and pipe set 2 feet back of fence 16 meters back of base of levee, on property of S. B. Yeager, on N. line of levee running back from Morville Ldg. to woods, and dividing Morville and Warnicott plantations. It is on N. side of ramp of this road and at gate in mouth of levee. It is 40 meters (?) above a prominent angle in the levee. (Note 48, p. 130.)

B. M.  $1\frac{3}{4}$ .—Near *Morville, Concordia Parish, La.*; stone and new pipe at back of edge of road at third turn row, back of road along levee. It is on the Moro plantation, 37 meters below a ditch which divides Moro from Bails plantation. Both plantations are run by Isaac Freidler. It is 442 meters back of fence, back of road, back of levee, and opposite a point 1 500 meters below the foot of Natchez Island.

T. B. M. 61.—Near *Vidalia, Concordia Parish, La.*; top of boat spike driven vertically in bench cut on downstream root of a 2-foot honey locust tree, 15 meters toward river, and 25 meters above P. B. M. Lucerna.

P. B. M. Lucerna.—Near *Vidalia, Concordia Parish, La.*; tile and pipe set  $\frac{1}{2}$  meter outside of fence, 4 meters back of center of road along fence, 94 meters back of base of levee of main road, 9 meters above a ditch leading back past the gin on the Lucerna plantation, belonging to Harry Lambert. There is a string of 8 or 10 cabins beginning about 75 meters below the pipe, 1 cabin about 75 meters above it. It is opposite 6-mile post below Vidalia, La., and opposite where the chute at the head of Natchez Island joins the main bank. (Note 48, p. 130.)

T. B. M. 62.—Near *Vidalia, Concordia Parish, La.*; a nail driven vertically in bench cut on root of a 3-foot cottonwood, on road side of tree, standing in fence line, back of road, back of levee, at end of hedge dividing Lucerna from St. Genevieve plantation.

T. B. M. 63.—Near *Vidalia, Concordia Parish, La.*; top of boat spike driven vertically in bench cut on N. side of a 12-inch willow tree, standing at S. edge of road along S. side of levee. It is about 100 meters above prominent angle in levee where road crosses to go back across field to plantation residence, and is  $1\frac{1}{4}$  miles below Whitehall Ldg., La.

New B. M.  $1\frac{3}{4}$ .—Near *Vidalia, Concordia Parish, La.*; tile and pipe set at inner base of levee at angle immediately back of where the old B. M.  $1\frac{3}{4}$  was on levee and now covered by levee enlargement. It is 261 meters below where the road crosses levee from Whitehall Ldg., La. It is due S. of the W. end of the Whitehall quarters, and  $355^\circ$  from negro church below quarters.

T. B. M. 66.—Near *Vidalia, Concordia Parish, La.*; top of boat spike driven vertically into bench cut on S. root of 3-foot pecan tree, 3 meters back of base of levee, 50 meters above prominent angle in same, 140 meters from R. B. of river. It is the lower tree in a pecan grove. It is on the Whitehall plantation 600 meters toward river from Vidalia road,  $2\frac{1}{4}$  miles below town of Vidalia, La.,  $\frac{3}{4}$  mile above Whitehall Ldg., La. A triangle is blazed on the tree above B. M. Levee B. M. 448 is on the same tree.

Levee B. M. 448.—Near *Vidalia, Concordia Parish, La.*; top of head of galvanized spike driven horizontally into levee face of same tree bearing T. B. M. 66. Elevation marked on copper plate beside spike=86.58, which is above Cairo datum.

LXI (C. & G. S.)=Gaither Triangulation Station.—Near *Vidalia, Concordia Parish, La.*; cross cut on top of iron screw pile marking triangulation station Gaither. It is in field  $2\frac{1}{2}$  meters S. of fence along S. side of Whitehall-Vidalia road. It is 107 meters W. (measured along road) of fence surrounding small cabin on S. side of road. It is 300 meters N. of an angle in the levee, and 680 meters W. of a square angle in levee where it turns S. from main road after following along its S. side from Vidalia. It is on land of Henry Gaither and  $\frac{1}{4}$  miles below Vidalia, La. (See also App. 8, Report for 1899, p. 608.)

T. B. M. 69.—*Vidalia, Concordia Parish, La.*; top of spike driven vertically into bench cut on W. root of a lone 3-foot pecan tree, standing in the yards of the N. O. & N. W. R. R., in the lower end of the town of Vidalia, La. It is 160 meters N. of river, 75 meters N. of levee, 50 meters W. of round house, and 50 meters S. of road in front of office of Union Oil Mill.

LXII (C. & G. S.)—*Vidalia, Concordia Parish, La.*; bottom of square cavity cut in top of marble post set in ground at the right of the steps to the front entrance to Judge L. F. Mason's residence in the lower part of the town of Vidalia, Concordia Parish, La. Top of post is 2 inches above ground. (See also App. 8, Report for 1899, p. 608.)

LXIII (C. & G. S.)=East Base.—*Vidalia, Concordia Parish, La.*; top of copper bolt in center of top of monument marking SE. end of the Vidalia base line. It is in a lot immediately back of the courthouse and jail at Vidalia, Concordia Parish, La. It is 14 inches square at top and projects about as much above ground. Lot is owned by J. Conti, of Natchez, Miss. Stone is marked 1878 on river side, and U. S. C. S. on the opposite side. It is 55 meters from Lake Concordia road on Trinity st., 80 meters from levee. Top of bolt is slightly battered. Level party from Vicksburg U. S. Engr. office connected with these B. M.'s in 1893 and said this B. M. was disturbed, but did not say in what way. It shows a settlement of about 50 millimeters over the other C. & G. S. B. Ms. in the vicinity, and probably this difference in elevation is the disturbance intended. It seems to be intact. No one in the neighborhood knows of its ever being disturbed, but they say the ground in the vicinity is soft under the surface. (See also App. 8, Report for 1899, p. 608.)

B. M.  $1\frac{1}{2}$ .—*Vidalia, Concordia Parish, La.*; flat stone and iron pipe on W. side of Trinity street, Vidalia, La., 440 meters back from N. line of street nearest the river,  $135^{\circ} 20'$ —420 meters from courthouse, and  $194^{\circ} 00'$ —448 meters from church. Rod held on (+) on stone 83 millimeters NE. of center of stone. This point is outside of pipe, but stone is smooth and nearly level. (See also App. 8, Report for 1899, p. 677.)

T. B. M. 71.—Near *Vidalia, Concordia Parish, La.*; top of 30d boat spike driven vertically into stump of 6-inch honey locust tree, 1 meter back of fence, back of road, back of levee, on R. B., 1 000 meters above the court-house at Vidalia, La. It is 120 meters below cabin occupied by Demp Pierce (colored).

P. B. M. Waterworks.—*Natchez, Adams Co., Miss.*; tile and pipe set 1 meter N. of S. fence of inclosure of Natchez waterworks pumping station, under the hill. It is  $1\frac{1}{2}$  meters below pipe leading out of ground to SW. corner of settling basin. It is in line with the fence leading downstream from said inclosure along the E. side of the road leading to ice plant. (Note 48, p. 130.)

B. M. N. (Ewens 1886).—At *Natchez, Adams Co., Miss.*; top of head of boat spike driven horizontally into second mortar course above ground, 0.75 meter (or  $2\frac{1}{2}$  feet) above the downstream river corner of the brick building owned by the Natchez Ice Co. B. M. is on the river face of the building, and has the letter N cut in the second brick above the spike. This was formerly used as one of the bench marks for the U. S. gauge at Natchez, but its settlement had caused it to be abandoned for some years. (See also App. 8, Report for 1899, p. 677.)

T. B. M. 77.—At *Natchez, Adams Co., Miss.*; top of 40d wire nail driven vertically in bench cut on upstream root of a 10-inch chinaberry tree, 0.9 meter above upstream river corner of brick building on which is situated B. M. 3 (Babbitt 1874). Useful as Natchez gauge B. M.

B. M. 3 (Babbitt 1874).—At *Natchez, Adams Co., Miss.*, long used as gauge B. M. for Natchez U. S. Engr. gauge. It is marked thus—V cut on iron door sill, 0.065 meter back from river end of sill, on upstream side of brick building known as the Ray & Grant building, under the hill. Building is on the river side of the street and electric railroad track to the ferry, and below the street leading to coal office and elevator. B. M. is 3.5 meters toward river from upstream land corner of the building. (See also App. 8, Report for 1899, p. 677.)

B. M. A. (Ewens 1892).—At *Natchez, Adams Co., Miss.*, one of the Natchez U. S. Engr. gauge B. Ms. Is top of head of a large nail driven horizontally into third mortar course above floor of gallery of John Contis' building, standing on the E. or land side of the street and electric railroad track leading

up the hill from the ferry, Natchez, Miss. It is 45 meters above or N. of B. M. 3 (Babbitt 1874). Nail is now flush with wall. It is 1.35 meters or  $4\frac{1}{2}$  feet to the left of the center of the center door to said building. This door is No. 79. Building is used as a boarding house by Miss E. Mason.

P. B. M. 1.—*Natchez, Adams Co., Miss.*, for United States Engr. gauge, is stone and pipe in middle park on the bluff at head of street leading up from "under the hill." It is near a large red-oak tree and in line with the N. side of Bontura alley, which is midway between and parallel with Main and State streets. The cap on the pipe has the raised letters U. S. E. B. M. around a raised knob in the center. (See also App. 8, Report for 1899, p. 677.)

LXIV (C. & G. S.)=Palo Alto Triangulation Station.—*Palo Alto, Concordia Parish, La.*; a cross on top of iron screw pile on R. R.,  $1\frac{1}{4}$  miles above the court-house at Vidalia, La., on Palo Alto plantation belonging to D. Minor, of Natchez, Miss. It marks the Triangulation Station Palo Alto of the C. & G. S. It stands in turn row, 256 meters back of levee, 7 meters back of road where it turns from back end of an old barn to toward upriver. It is 155 meters back of downstream land corner of old barn. It is 64 meters S. of the western one of two old cisterns where stands an old double bushy tree. It is  $170^{\circ}-44$  meters from a 30-inch pecan tree which is the upstream one of a scattering grove of six. It is opposite a curve in the main levee, and 15 meters S. of the western prolongation of a spur of levee leading toward the river. It is approximately  $110^{\circ}$  from the old marine hospital on bluff above Natchez, Miss. (See also App. 8, Report for 1899, p. 608.)

B. M.  $1\frac{3}{4}$ .—Near *Vidalia, Concordia Parish, La.*; stone post standing on W. side of ditch, W. of road, 7 meters W. of base of levee, about 20 meters below an angle in levee and 141 meters below square angle in levee, at junction with old levee, where new levee turns W. to go upriver. It is on land of D. Minor, of Natchez, Miss. An 8-inch pecan tree stands 14 meters below the stone on the W. bank of the ditch, and is blazed with a triangle facing the stone. It is the first tree below the corner of levee above mentioned.

B. M.  $1\frac{3}{4}$ .—*Vidalia, Concordia Parish, La.*; flat stone and new pipe standing on the NE. edge of ditch between two roads 96 meters SE. from the junction of these two roads with road running NE. and SW. parallel with the levee. It is 250 meters S. of prominent angle in levee, which is at upper end of a clump of brush and trees in low ground along the levee. It is  $32^{\circ} 10'$ , 325 meters from junction of levees on R. B., on Dr. Carter's plantation. Cap was gone off old pipe. A new pipe was placed over stone. Its cap is only 3 inches above ground. Set the old pipe in the corner of the hole as a finder for the new. It is  $\frac{1}{2}$  meter S. of the new.

T. B. M. 84.—Near *Vidalia, Concordia Parish, La.*; top of a boat spike driven vertically into bench cut on the root on inner or land side of 3-foot elm tree, on R. B. on land of F. D. Brown (Minorca plantation) near foot of old Lake Concordia, and about 6 miles above Vidalia, La. It is 28 meters back of base of levee and 4 meters outside of fence, 4 meters below old Minorca store building,  $4\frac{1}{2}$  meters out from P. B. M. Minorca. Tree is just back of head of willow and cottonwood bar, and back of and 40 meters below H. W. gauge No. 60.

P. B. M. Minorca.—Near *Vidalia, Concordia Parish, La.*; tile and pipe set  $\frac{1}{2}$  meter back of fence in small garden, 4 meters below old Minorca store building, on Minorca plantation owned by F. D. Brown, on R. B. opposite head of willow and cottonwood bar, near foot of old Lake Concordia. It is 44 meters back of top of levee, and about 40 meters below, and 65 meters back of H. W. gauge No. 60. (Note 48, p. 130.)

P. B. M. Sycamore.—Near *Bullitt Bayou, Concordia Parish, La.*; tile and pipe set  $1\frac{1}{4}$  meters back of fence, 25 meters back of inner base of levee, 21 meters above the Sycamore store, on Sycamore plantation owned by A. T. Caloit, run by H. W. Carter, agent, on R. B. It is halfway between store and gate to the road leading back to the plantation house. It is 500 meters above a point opposite foot of Vidal Island. (Note 48, p. 130.)

T. B. M. 92.—Near *Bullitt Bayou, Concordia Parish, La.*; top of boat spike driven vertically into bench cut on root on inner or land side of a 30-inch lone thorn tree on the property of A. H. Gillaspay, near river side of Vidal Island and near its middle from head to foot. Tree is at inner base of levee, 35 meters from and a little below Potowamac gin. Tree is 19 meters SW. of P. B. M. Vidal.

P. B. M. Vidal.—Near *Bullitt Bayou, Concordia Parish, La.*; tile and pipe on the property of A. H. Gillaspay, about the middle of river side of Vidal Island. It is 30 meters back from bank of old Lake Concordia, and about 300 meters above colored Baptist church. It is in line with the lower wall of the Potowamac gin, and 27 meters out from same. It is 8 meters back of base of levee, 1 meter out from

fence,  $2\frac{1}{2}$  meters below cotton storehouse, and 19 meters NE. of a lone 30-inch thorn tree bearing T. B. M. 92 and blazed with a triangle facing the pipe. (Note 48, p. 130.)

T. B. M. 93.—Near *Bullitt Bayou, Concordia Parish, La.*; top of boat spike driven vertically into bench cut on the outer or S. root of 24-inch pecan tree standing in line of fence at upper end of Vidal Island. It is about  $\frac{7}{8}$  mile by road westwardly from main levee, 40 meters N. of bank of Lake Concordia, and about 360 meters below or westwardly from the uppermost cabin on island, and about 125 meters eastwardly from another cabin.

T. B. M. 95.—Near *Bullitt Bayou, Concordia Parish, La.*; top of boat spike driven vertically into bench cut on root of levee side of a 24-inch pecan tree, standing in line of fence, back of road, back of levee. It is 25 meters below, or W. of, B. M.  $1\frac{3}{4}$ .

B. M.  $1\frac{3}{4}$ .—Near *Bullitt Bayou, Concordia Parish, La.*; tile and new pipe standing 2 meters back of fence line in field on N. side of road N. of levee. It is 143 meters above junction of levees and 85 meters below where road leads back through Grasmere plantation. It is 34 meters below one and 25 meters above another blazed 2-foot pecan tree in fence line. The lower or westerly one bears T. B. M. 95. It is 700 meters back or N. of former Good Hope Ldg., now abandoned on account of sand bar in front. It is 1 400 meters up old levee from the present Bullitt Bayou Ldg.

T. B. M. 96.—Near *Bullitt Bayou, Concordia Parish, La.*; top of 30d boat spike driven vertically into bench cut on S. root of a 3-foot pecan tree standing 1 meter outside of fence, and 475 meters below angle in levee, and 860 meters above B. M.  $1\frac{3}{4}$ . This tree is the lower one of two large pecans standing 25 meters apart.

T. B. M. 98.—Near *Mabel, Concordia Parish, La.*; top of 30d boat spike driven vertically into center of 6-inch honey locust stump standing at back or NW. edge of borrow pit (water in it) and 24 meters toward angle in levee from P. B. M. Vacluse.

P. B. M. Vacluse.—Near *Mabel, Concordia Parish, La.*; tile and pipe set 1 meter SE. of fence around yard of a large double cabin, 5 meters NE. of center road leading back across the Vacluse plantation; George Kelly, owner; William Dicks, agent. It is 50 meters W. of inner base of levee at prominent angle where it turns upriver. It is about 400 meters up levee from prominent angle at junction with old levee where it runs out to river. There is a large cluster of cabins below this road which passed just below the B. M. (Note 48, p. 130.)

B. M.  $1\frac{3}{4}$ .—Near *Mabel, Concordia Parish, La.*; flat stone and pipe in field on James Branham's plantation, 210 meters N. of old road along Lake St. John. It is back of the present Gibson Ldg., and directly back of where landing road crosses levee. It is 226 meters back of base of levee.

T. B. M. 103.—Near *L'Argent, Tensas Parish, La.*; top of wire nail driven vertically into bench cut on root on levee side of 30-inch pecan tree, standing in road, 2 meters outside of fence, and 6 meters back of base of levee on "Hole-in-the-Wall" plantation. It is just back of the former "Hole-in-the-Wall" Ldg., now obsolete on account of willow bar in front. It is 144 meters above the "Hole-in-the-Wall" store, and 470 meters above a prominent angle in levee. Triangle blazed on tree above nail.

B. M.  $1\frac{3}{4}$ .—Near *L'Argent, Tensas Parish, La.*; stone post standing  $\frac{3}{4}$  meter above one fence and  $2\frac{3}{4}$  meters out from another in small stable lot, below cabin of Amos Daniel (colored), on Monona plantation, run by J. A. Turpin. It is 200 meters below the old Monona Ldg., now obsolete, 40 meters back of levee, and 150 meters above road running back to New Quarters Lake, past Mr. Turpin's house. It is 840 meters below where levee crosses L'Argent Bayou. Rod was held on S. edge of hole in stone, it being highest part of stone. Stone is about 1 foot above ground.

T. B. M. 104.—Near *L'Argent, Tensas Parish, La.*; top of 30d boat spike driven vertically into bench cut on S. root of a 5-foot cottonwood tree, standing on slope of E. bank of L'Argent Bayou, back of road back of levee. It is 118 meters toward the river and landing from L'Argent P. O., La.

P. B. M. Fairchilds Island.—*Fairchilds Island, Tensas Parish, La.*; tile and pipe on L. B. on upper half of Fairchilds Island, on Fairchilds Island plantation, property of Britton and Kuntz Bank, of Natchez, Miss.; Shelly Baker, agent. It is about 300 meters above stone line 126, 75 meters back of top of L. B. of river, on line of lower face of a large gin and 2 meters SE. of corner of same. (Note 48, p. 130.)

B. M.  $1\frac{3}{4}$ .—Near *Waterproof, Tensas Parish, La.*; stone post in field on R. B. on Sunnybank plantation, 355 meters E. of main levee, 155 meters W. of an old levee. It is  $\frac{3}{4}$  mile below the lower end of the town of Waterproof, La. Stone stands 18 inches above the ground, but appears solid. There are three cisterns around stone; one W. of N., 16 meters; one W. of S., 38 meters; and one ENE., 32 meters. Rod held on highest part of stone, which is the E. part of the letter S.

LXXI (C. & G. S.).—*Waterproof, Tensas Parish, La.*; bottom of square cavity cut in top of marble post, 5 inches square and 2.5 feet long, buried in ground on left of and quite near the steps leading to the front entrance of Mr. A. P. Martin's residence at Waterproof, Tensas Parish, La. It is the lower residence on the street along the base of the levee, and is 250 meters below a lane leading back into the country past a church on its N. side and at upper edge of town of Waterproof, La.

P. B. M. Melwood.—Near *Goldman, Tensas Parish, La.*; tile and pipe in the yard surrounding the old Melwood plantation house on R. B., owned by G. C. Goldman, and 700 meters back, along levee, from Goldman Ldg., La., 290 meters below square angle in levee where it turns N. to continue up river. It is in SE. or upstream corner of yard, 0.8 meter from either fence. (Note 48, p. 130.)

T. B. M. 114=T. B. M. 65a for H. W. Gauge No. 65.—Near *Goldman, Tensas Parish, La.*; top of levee B. M. pipe at junction of levees back of Goldman Ldg., La. Rod held on W. edge of pipe.

P. B. M. Kempe Bend.—Near *Goldman, Tensas Parish, La.*; tile and pipe set in field, cleared in woods, on R. B., on property of G. C. Goldman, and known as Miller's ridge. It is about  $2\frac{1}{4}$  miles above Goldmans Ldg., La., 800 meters above upper road crossing to levee to Kempes Ldg. It sets 3 feet SW. of SW. corner of fence surrounding small cabin occupied by Isaac Kennedy (colored). It is 98 meters back of base of levee and 400 meters below junction of new loop with old levee. (Note 48, p. 130.)

T. B. M. 120.—Near *Goldman, Tensas Parish, La.*; top of 30d boat spike driven vertically into bench cut on SW. corner of a 6-foot triple cypress tree, standing  $4\frac{1}{2}$  meters N. of P. B. M. Stackhouse.

P. B. M. Stackhouse.—Near *Goldman, Tensas Parish, La.*; tile and pipe set on top of S. bank of a bayou,  $\frac{1}{2}$  meter W. of a wire fence,  $4\frac{1}{2}$  meters S. of two large cypress trees, standing at the water's edge in bayou, blazed with triangles facing pipe. It is on property of Mr. Stackhouse, rented by Charles Miller (colored), who lives in the house on same bank of bayou, 64 meters back of pipe. It is 63 meters back of inner base of levee, about 80 meters above prominent angle in the levee. It is on R. B. in upper part of Kempes Bend and 1 500 meters below the present Beelers Ldg. It is  $2\frac{1}{2}$  miles below the plantation residence of Mr. Frank C. Curry on the Villa Clara plantation and former Beelers Ldg. (Note 48, p. 130.)

No. 297 or LXXIII (C. & G. S.).—In *Tensas Parish, La.*, near *Rodney, Jefferson Co., Miss.*; bottom of square cavity in top of 5-inch square, 2.5 feet long marble post buried in ground on the left of, and quite near, the steps leading to the front entrance of Mr. Frank C. Curry's residence on the Villa Clara plantation, Tensas Parish, La., at former Beelers Ldg. The characters U. S. B. M. 1881 are cut on top of post around the cavity. Post stands about 8 inches above ground.

B. M.  $1\frac{3}{4}$ .—In *Tensas Parish, La.*; between *St. Joseph, La.*, and *Rodney, Miss.*; stone post, corners battered off, standing in back yard of Mr. Frank C. Curry's Villa Clara plantation residence. Rod held on highest point of stone, which is its NE. corner.

B. M.  $1\frac{1}{4}$ .—Near *St. Joseph, Tensas Parish, La.*; flat stone and pipe on R. B. in field on land of George Wallace. It is 15 meters in front of base of new levee, on upper slope of ramp where road crosses levee. It is 360 meters above house of George Wallace. A large barn outside levee stands in field about 100 meters above the B. M.; it is about 1 mile above the head of Rodney Island and  $1\frac{3}{4}$  miles below the lower *St. Joseph Ldg.*

No. 291 (C. & G. S.).—Near *St. Joseph, Tensas Parish, La.*; center of head of copper bolt leaded horizontally in the N. face of brick chimney of gin house on Duck Pond plantation, owned by Capt. Robert Worrell. It is in fifth brick from NE. edge of the chimney, and in seventh course below the projecting course. The gin is about 2 000 meters below the town of *St. Joseph, La.*, and 500 meters back from *St. Joseph Lower Ldg.*

B. M. A (1892)=*St. Joseph M. R. C. Gauge B. M.*—*St. Joseph, Tensas Parish, La.*; top of head of large boat spike driven horizontally into W. side of large cottonwood tree bearing high-water section of gauge and is 40.89 feet on gauge. This spike was set beside the old one in November, 1900, at same elevation, as old one was grown over. This is the lower one of eleven large cottonwoods nearly in a row along outside of spur levee.

P. B. M. Worrell.—*St. Joseph, Tensas Parish, La.*; tile and pipe on R. B. on property of Capt. Robert Worrell, just back of and a little above lower *St. Joseph Ldg., La.* It is on inner slope of small spur levee, 145 meters above warehouse and gauge bulletin. It is  $1\frac{1}{2}$  meters S. of fence crossing levee and leading back to Captain Worrell's residence. A blazed 30-inch pecan tree stands 5 meters N. of pipe on

inner slope of levee, a 4-foot blazed cottonwood stands at outer base of levee, 13 meters SE. of pipe, and is the upper one of eleven large cottonwoods nearly in a row along the outside of spur levee. Another blazed 4-foot cottonwood stands at the junction of fences 18 meters SW. of pipe. (Note 48, p. 130.)

P. B. M. Woodland.—Near *Rodney*, in *Claiborne Co., Miss.*, opposite *St. Joseph, Tensas Parish, La.*; tile and pipe on L. B. opposite a point about midway between the upper and lower *St. Joseph Ldgs.* On Woodland plantation about 250 meters below the house of Neal Bailey (colored). It is 2 feet outside of fence of small inclosure, 24 meters above a small cabin, 128 meters back of top of L. B. of river. A blazed 30-inch pecan tree stands E. of S., 32 meters, a blazed 30-inch pecan stands N. of W. 62.5 meters, and a blazed 14-inch honey locust tree stands S. 18.5 meters. (Note 48, p. 130.)

T. B. M. 136.—*St. Joseph, Tensas Parish, La.*; top of 30d boat spike driven vertically into bench cut on S. root of a 30-inch soft maple tree standing just back of the SW. corner of the old Masonic Hall in *St. Joseph, La.*

P. B. M. *St. Joseph*.—*St. Joseph, Tensas Parish, La.*; tile and pipe set in court-house square in lower end of town of *St. Joseph, La.* It is in outer middle half of square, 57 meters back of levee in line with a 36-inch gum tree and near door of old Masonic Hall. It is 10 meters from rear steps of Masonic Hall, and  $2\frac{1}{2}$  meters from said gum tree. A 30-inch soft maple tree bearing T. B. M. 136 stands 10 meters SE. of pipe. (Note 48, p. 130.)

No. 286.—Near *St. Joseph, Tensas Parish, La.*; center of hole (the copper bolt being gone) in center of face of fourth brick from NE. corner, twenty-third course from ground, of brick chimney of gin house on Panola plantation, owned by J. M. Gillespie. It is about 2 000 meters above the town of *St. Joseph, La.*, and about 1 500 meters below where levee crosses Bayou Bruin. (Note 48, p. 130.)

P. B. M. Bruin.—Near *St. Joseph, Tensas Parish, La.*; tile and pipe on R. B., set  $\frac{1}{2}$  meter S. of fence around garden on W. side of the Bruin Bayou store, 1.3 meters E. of the corner of fence on E. side of lane leading in a northwesterly direction to go to Bruin Island. It is 25 meters W. of Bruin Bayou store, run by Geary Neal, on Chetwind plantation. It is 118 meters W. of square angle in levee, 1 400 meters back of Claggett Ldg. It is 61 meters NE. of NE. bank of Bayou Bruin, and 1 600 meters along levee above the Panola gin. (Note 48, p. 130.)

T. B. M. 141.—Near *St. Joseph, Tensas Parish, La.*; top of boat spike driven vertically into bench cut on SE. root of a 15-inch gum tree standing on N. slope of levee, 250 meters below junction of levees back of Claggett Ldg.

P. B. M. Botany Bay.—Near *St. Joseph, Tensas Parish, La.*; tile and pipe set on top of N. bank of Catfish Bayou, on Botany Bay plantation, on R. B., owned by Mr. James Curry. It is 32 meters S., or downstream, from SE. corner of gin, and 34 meters W. of inner base of levee, 7 meters W. of gate leading into gin-house yard from ramp over levee of road leading to Bondurant Ldg. It is about 1 mile from river along road along S. side of Catfish Bayou. It is 1 meter NE. of junction of wire fences. It is about E. of Mr. Curry's house, which stands on bank of Lake Bruin. (Note 48, p. 130.)

P. B. M. Winter Quarters.—Near *Hard Times Landing, Tensas Parish, La.*; tile and pipe on Winter Quarters plantation on R. B., owned by J. M. G. Gillespie. It is about 2 miles NE. of Lake Bruin, and  $\frac{3}{4}$  mile back of bank of river, 1 mile above a prominent angle in levee,  $1\frac{1}{2}$  miles below junction of old and new levees. It is 8 meters back of base of levee, 3 meters S. of ditch, and 10 meters above center of road that runs back to plantation residence and store, same road crosses levee and runs straight out to river to a point  $\frac{1}{4}$  mile below end of levee and U. S. Light. (Note 48, p. 130.)

P. B. M. Hard Times.—Near *Hard Times Landing, Tensas Parish, La.*; tile and pipe set at inner base of small spur levee, and 3 meters SE. of another spur levee running along S. bank of Lake *St. Joseph*. It is 180 meters back of junction of levees back of Hard Times Ldg., *La.*, on Hard Times plantation, owned by D. Morris. It is 35 meters back of cabin occupied by Nick Walker (colored), and about 30 meters E. of the line of the Nutt plantation (line is not marked). (Note 48, p. 130.)

T. B. M. 157.—Near *Hard Times Landing, Tensas Parish, La.*; top of a 20d boat spike driven vertically into bench cut on SE. root of a 2-foot sycamore tree standing 8 meters below old spur levee and 13 meters above P. B. M. 272. Tree blazed with a triangle facing the pipe.

No. 272 (C. & G. S.).—Near *Hard Times Landing, Tensas Parish, La.*; tile and pipe put in in 1892 to replace old C. & G. S. P. B. M. 272 which was broken, the connection being by ordinary levels. It is on the Hard Times plantation, owned by D. Morris, 135 meters back of his residence, back of the old landing. It is 22 meters below the old spur levee leading back from the old landing to junction of



levees, on lower bank of Lake St. Joseph. It is at upper edge of a small clump of black locusts, 8 meters toward river and 13 meters below a small cabin. A 2-foot sycamore tree stands NNW. 13 meters and bears a triangle blazed facing the pipe, and also bears T. B. M. 157. It is 380 meters E. of junction of levees back of Hard Times Ldg. The cap on the pipe is of the B. M. form which has a square in center with the letters U. S. B. M. around it. (Note 48, p. 130.)

T. B. M. 161.—Near *Hard Times Landing, Tensas Parish, La.*; top of boat spike driven vertically into bench cut on outer or E. root of a 3-foot pecan tree, in woods, 23 meters back of base of levee, in upper half of a piece of woods from which the brush has been cleared away, and once used as a levee camp ground. Same tree bears levee B. M. or U. S. B. M. No. 133. A large square blaze is cut on levee side of tree. It is just 3 miles, measured along the levee, above junction of levees back of Hard Times Ldg.

Levee B. M. 133.—Near *Hard Times Landing, Tensas Parish, La.*; top of head of galvanized spike driven horizontally into levee face of a 3-foot pecan tree bearing T. B. M. 161. Copper plate beside spike gives elevation 101.34, which is feet above Cairo datum.

P. B. M. Bland.—Near *Point Pleasant, Tensas Parish, La.*; tile and pipe set 1 meter outside of fence, at inner base of levee, and approximately on the plantation line between Buck Ridge and Limerick. The Buck Ridge place is owned by Lucien Bland, the Limerick is run by Harry R. Guthrie, agent. It is 120 meters below angle in the levee where it turns from WSW. to E., and on the lower side of the neck of land below Lake Palmyra, and about 2 miles NW. of Ship Bayou Ldg. (Note 48, p. 130.)

T. B. M. 170.—Near *Point Pleasant, Tensas Parish, La.*; top of boat spike driven vertically into bench cut on SW. root of a lone 40-inch cottonwood tree standing 32 meters back or S. of inner base of levee on Limerick plantation, run by Harry R. Guthrie, agent. It is about  $\frac{3}{4}$  mile back from Limerick Ldg., on Lake Palmyra, and 50 meters W. of a cabin occupied by Neal Brooks (colored).

P. B. M. McMillan.—Near *Point Pleasant, Tensas Parish, La.*; tile and pipe set in corner of cotton field on the Burn plantation, owned by Dr. McMillan. It is about 1 mile above the lower mouth of Lake Palmyra, and 135 meters back of bank of lake at Burn Ldg. It is 2 feet inside of fences, 4 meters back of base of levee, and 10 meters above or W. of center of road that crosses the levee and runs to plantation residence. (Note 48, p. 130.)

T. B. M. 175.—Near *Ashwood, Tensas Parish, La.*; top of boat spike driven vertically into bench cut on the NE. root of a  $3\frac{1}{2}$ -foot water oak tree on the property of Perkins estate, known as Somerset plantation. It is about  $\frac{1}{4}$  mile back of Ashwood Ldg., La., store and post-office, which is on the bank of Lake Palmyra, and 170 meters back of the levee. The tree is the oak that is nearest the NW. corner of a large grove of inclosed oak trees, and is about 50 meters E. or toward river or lake, from the house of J. G. O'Kelly. It is 26 meters E. of P. B. M. Somerset.

P. B. M. Somerset.—Near *Ashwood, Tensas Parish, La.*; tile and pipe set on the Somerset plantation on R. B. of Lake Palmyra, 440 meters back of Ashwood Ldg. store and post-office, La., and 190 meters back of levee. It is in the NE. corner of lot surrounding the house of J. G. O'Kelly, and 3 feet from either fence. A large grove of inclosed oak trees lies between lot and levee. (Note 48, p. 130.)

T. B. M. 176.—Near *Ashwood, Tensas Parish, La.*; top of 20d boat spike driven vertically into bench cut on the E. root of a 30-inch gum tree standing in fence line at upper end of gate in front of cabin occupied by Joseph Handy (colored) on Somerset plantation, 20 meters back of inner base of levee, 40 meters above angle in same, and about 1 200 meters above Somerset or Ashwood Ldg. Tree bears a triangle blazed above B. M.

T. B. M. 180.—Near *King, Madison Parish, La.*; top of boat spike driven vertically into bench cut on SE. root of 3-foot pecan tree, standing in field on Leona plantation, owned by H. C. Collins. It is directly back of Collins Ldg., and about 600 meters below New Carthage Ldg., 44 meters back of base of levee, and 9 meters back of fence that surrounds Collins's house. It is 10 meters W. of P. B. M. Leona; a blazed triangle is on tree over B. M.

P. B. M. Leona.—Near *King, Madison Parish, La.*; tile and pipe set on property of H. C. Collins, and known as the Leona plantation, and is directly back of Collins Ldg. and 600 meters below New Carthage Ldg. It is in SW. corner of Collins's yard,  $2\frac{1}{2}$  feet from either fence, and 44 meters back of base of levee. A lone 3-foot pecan tree that bears T. B. M. 180 stands in field 10 meters W. or below B. M. (Note 48, p. 130.)

T. B. M. 183.—Near *King, Madison Parish, La.*; top of a 30d boat spike driven vertically into bench cut on SE. root of a  $3\frac{1}{2}$ -foot pecan tree standing 12 meters back of base of levee, and on bank of Bayou Vidal. It is 70 meters above angle in levee, which is 1 500 meters above the prominent angle in levee opposite King P. O., La. It is 110 meters above cabin, occupied by Joseph Gafer (colored), on House plantation owned by Henry House.

P. B. M. Chelula.—Near *King, Madison Parish, La.*; tile and pipe set 45 meters back or N. of center of levee, 5 meters above or E. of center of road which crosses levee on a very large ramp,  $2\frac{1}{2}$  miles above King P. O., La., 2 miles below a point on the levee opposite the foot of Diamond Island. It is on the S. bank of a ditch, 10 meters SE. of a small bridge over this ditch. A 12-inch cottonwood stands SE. 5 meters, with a blazed triangle facing the pipe. It is at the edge of scattering timber, brush, and vines. It is 465 meters above where fence crosses levee at upper or E. side of a long field along SE. bank of Bayou Vidal, 622 meters above angle in levee, where it leaves Bayou Vidal, opposite cabin occupied by Link Courteney (colored). B. M. is on Chelula plantation owned by T. P. Kelly, of King P. O., La. (Note 48, p. 130.)

No. 232 (C. & G. S.).—In *Madison Parish, La.*; between *King* and *Griffin*, center of head of copper bolt leaded horizontally in the E. chimney of dwelling house of O. Christmas, on Crystal Springs plantation, Madison Parish, La. The brick is the second from the SE. edge of the chimney, and is in the twelfth course from the ground. The house is 200 meters back from the base of the levee, and about 1 mile back of the R. B. of river and about 5 miles below Warrenton, Miss., by river, and 3 miles below present Bedford Ldg. by the levee.

T. B. M. 193.—Near *Griffin, Madison Parish, La.*; top of boat spike driven vertically into bench cut on SW. root of a 30-inch pecan tree standing 4 meters N. of P. B. M. Griffin.

P. B. M. Griffin.—Near *Griffin, Madison Parish, La.*, is tile and pipe set in field on property of Muench & Sons,  $\frac{3}{4}$  mile back of L. B. of river, about 1 mile below the present Bedford Ldg. along the levee. It is 755 meters in a S. westerly direction and along levee from a right angle in same. It is 21 meters back or N. of base of levee at another angle in same. It is 4 meters S. of blazed 30-inch pecan tree bearing T. B. M. 193, and 86 meters E. of another 30-inch pecan tree that stands at base of levee. It is near former B. M. <sup>149</sup> which could not be found. It is about  $\frac{1}{2}$  mile S. of Griffin P. O. and Bedford store. (Note 48, p. 130.)

T. B. M. 194.—Near *Griffin, Madison Parish, La.*; top of boat spike driven vertically into bench cut on SE. root of a lone 30-inch pecan tree standing in field near right angle in levee on property of Muench & Sons and 320 meters back of L. B. of river,  $\frac{1}{2}$  meter below Bedford Ldg. Tree is 3 meters N. of one levee, and 50 meters SW. of the other. Tree has triangle blazed on it over the B. M. It is  $\frac{1}{2}$  mile SE. of Griffin P. O., La., or Bedford store.

T. B. M. 197.—Near *Griffin, Madison Parish, La.*; top of boat spike driven vertically into top of 3-foot cottonwood stump standing at back edge of barrow pit, 20 meters back of base of levee, at angle at junction with old levee. Spike is near levee edge of stump. It is 2 miles above Bedford Landing and 3 miles below P. B. M. Martin along new levee.

P. B. M. Martin.—Near *Delta, Madison Parish, La.*; tile and pipe set on R. B. on property of Ann Martin, about 3 000 meters below Grants Canal, in Delta, La. It stands  $\frac{3}{4}$  meter S. of cabin occupied by Jack Miller, and 5 meters N. of corner gallery, and about 20 meters N. of new levee (now under construction), and 78 meters W. of old levee, and about 150 meters above house of Ann Martin. It stands between 2 young peach trees, and 14 meters N. of a 12-inch pecan tree. It is about 200 meters above H. W. gauge 75. (Note 48, p. 130.)

Range stone for SW. Base.—At *Delta, Madison Parish, La.*; a stone post 6 inches square and  $3\frac{1}{2}$  feet long. It has  $\frac{1}{4}$ -inch copper bolt with a cross on it in center for B. M. It is 85.12 feet from SW. Base in prolongation of the line NE. Base—SW. Base. It bears the characters U. S. C. S. and 1878 on it.

SW. Base=B. M. <sup>197</sup>.—At *Delta, Madison Parish, La.*; a limestone monument 4 feet long, dressed to 14 x 14 inches at top, with a  $\frac{1}{4}$ -inch copper bolt with a cross on it in center of top. It marks the SW. end of the Delta Base line of the C. & G. S. and bears the characters U. S. C. S. and 1878 on it. It is at the SW. end of the town of Delta, La., and just across the V. S. and P. R. R. (and 10 meters from it), and in prolongation of the S. side of Main street. It is on the SE. side of the county road, or Main st. prolonged, and 390 meters below Grants Canal. Stone is 6 inches above ground. (See also App. 8, Report for 1899, p. 636.)

P. B. M. Delta.—At *Delta, Madison Parish, La.*; tile and pipe set in the yard surrounding the section house (No. 7) of the V. S. and P. R. R. in the town of Delta, La. It stands near NE. corner of house in line with front edge of gallery and 2 feet from corner of same. It is 62 meters below nearest corner of round house, 200 meters above Delta Point station, and 50 meters back of base of levee, and 11 meters S. of main track of R. R. A 12-inch mulberry tree stands 4 meters NW. (Note 48, p. 130.)

NE. Base.—Near *Delta, Madison Parish, La.*; a limestone monument 4 feet long, dressed to 14 x 14 inches at top with a  $\frac{1}{4}$ -inch copper bolt with a cross on it in center of top. It marks the NE. end of the Delta Base line of the C. & G. S. and bears the characters U. S. C. S. and 1878 on it. It is on the point above Delta, directly in the line of Main street prolonged, and 80 meters SW. of R. R. incline. It is 6 inches underground. A 3-inch iron pipe 1 foot above ground, stands 5 feet N., an iron switch bar stands 5 feet W., as finders for the stone. The copper bolt has been somewhat battered, and the U. S. Engr. office at Vicksburg cut a small square on stone 0.01 meter N. of the bolt and used it for elevation. It is 0.5 millimeter higher than top of bolt. (See also App. 8, Report for 1899, p. 636.)

P. B. M. B.—Near *Vicksburg, Warren Co., Miss.*; the intersection of a cross in the end of a copper bolt leaded horizontally into N. end of the brick pumping station of the Vicksburg, Miss., water works. The building is on L. B. of river, under the hill, and about 1.6 kilometers S. of the city limits of Vicksburg. The bolt is in the first course above the water table and in the third brick from the NW. corner of the building. (See also App. 8, Report for 1899, p. 636.)

M. R. C. 197.—At *Kleinston, Warren Co., Miss.*; copper bolt in marking stone, standing in open ground at Kleinston, below Vicksburg, Miss. It is 30 meters E. of incline to Delta transfer boat. It is between E. and W. road on N., and an old broken levee on S., extending back to high ground. It is 1 565 meters above Refuge Oil mill, 1 000 meters above Waterworks, and 1 178 meters below compress. It is nearly W. of R. R. bridge where P. B. M. Pelican is situated. It has three pieces of R. R. rail around it for protection. (See also App. 8, Report for 1899, p. 637.)

P. B. M. Pelicar.—At *Kleinston, Warren Co., Miss.*; top of copper bolt leaded vertically into top surface of eighth coping stone from the top of the S. wing of the W. abutment of the plate girder bridge of the A. & V. R. R. over street or main road from furniture factory to Kleinston. This bridge is on the curve about midway between the Y. & M. V. R. R. and the Yazoo Canal. It is the main route of all trains from the A. & V. R. R. depot to the incline of the Mississippi and Louisiana transfer to Delta, La. This stone is about on the level with the top surface of the bearing stone which carries the plate girders of this bridge. The bolt is in the middle of the stone E. and W., being 0.34 meter from each edge E. and W., and 0.10 meter N. of its S. edge. Bolt has the letters U. S. P. B. M. cut in stone around it. The B. M. is named for the big transfer boat of the Mississippi and Louisiana Transfer Company, plying between Kleinston, Miss., and Delta, La. (Note 48, p. 130.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN AITKIN AND GRAND RAPIDS, MINN., 1902.

[These descriptions are published in the Report of the Chief of Engineers for 1903, Supplement, pages 78 and 79, and are republished here, only those changes being made which are necessary for indexing.]

P. B. M. Court-house.—*Aitkin, Aitkin Co., Minn.* (See App. 8, Report for 1899, p. 785.)

P. B. M. 338.—*Aitkin, Aitkin Co., Minn.* (See App. 8, Report for 1899, p. 785.)

P. B. M. Lower Base.—Near *Aitkin, Aitkin Co., Minn.* (See App. 8, Report for 1899, p. 785.)

B. M. 338.—Near *Aitkin, Aitkin Co., Minn.* Not described.

P. B. M. Cut-off.—Tile and pipe, marked 1898, on right bank on N. side of Rice River Cut-off, 11 meters N. of cut-off, center of narrow strip of bank. Basswood, 22 inches diameter, N. 5 feet, blazed with a triangle. Cut-off is about 5 miles above *Aitkin, Minn.*

U. S. E. B. M. 202.—A flat stone and iron pipe, established by St. Paul office, in center of road, 10 meters N. of gate to river and SW. of corner of house owned by Gasper Vallencourt, opposite to gate in front of house, about  $4\frac{1}{2}$  miles above *Aitkin, Minn.*

P. B. M. Biggar.—Tile and pipe, marked 1898, on E. side of State road, 1 meter from fence, 10 meters S. of junction of private road at N. W. corner of Biggar Brothers' field, midway between two elm trees blazed with a triangle. P. B. M. is 125 meters from R. B. of river and 120 meters W. of Biggar's house, about 7 miles above *Aitkin, Minn.*

P. B. M. Sutton.—Near *Waldeck, Aitkin Co., Minn.*; tile and pipe, marked 1898, 16 meters N. of NW. corner of Sutton's house, 1 meter W. of fence along E. side of State road, 6 meters E. of center of road, 28 meters from R. B. of river, 20 meters below gully on E. side of road, 10 miles above *Aitkin, Minn.*

U. S. E. B. M. 209.—Near *Waldeck, Aitkin Co., Minn.*; flat stone and iron pipe 3 meters from R. B. of river, near middle of first bend below Waldeck post-office, 39 meters W. of Dan Smith's house, a small white frame; 9 meters E. of E. fence along State road near where road turns W. B. M. was established by St. Paul office. It is about 11 miles above *Aitkin, Minn.*

P. B. M. Waldeck.—*Waldeck, Aitkin Co., Minn.*; tile and pipe, marked 1898, 1 meter W. of E. fence along State road, on line with E. and W. fence 4 meters N. of Waldeck's house and post-office, 30 meters NW. of house, 52 meters from R. B. of river, 12 miles above Aitkin, Minn.

P. B. M. Fowlds.—Near *Waldeck, Aitkin Co., Minn.*; tile and pipe, marked 1898, 21 meters from R. B. of river, 66 meters NE. of Mrs. Bertha Fowlds's house, 8 meters SW. of State road,  $\frac{1}{2}$  meter E. of fence in front of Mrs. Fowlds's house, near angle in fence at junction of fences, 15.2 miles above Aitkin, Minn.

P. B. M. Strand.—Near *Waldeck, Aitkin Co., Minn.*; tile and pipe, marked 1898, 1 meter from fence, 3 meters from center State road, 4 meters above angle in fence at end of lane running E. from in front of Strand's house, 14 meters from R. B. of river, 380 meters below James White's house, 700 meters E. of Nelson Strand's house; 30-inch elm SW. 27.7 meters, blazed with a triangle; about 17.5 miles above Aitkin, Minn.

P. B. M. Carlson.—Near *Portage, Aitkin Co., Minn.*; tile and pipe, marked 1898, on E. side of State road, 49 meters from R. B., on high sand point at lower edge of balsam thicket, 125 meters below three log houses on R. B. Carlson Hendricks and Toby Carlson live on opposite side of river; about 20 miles above Aitkin, Minn.

P. B. M. School.—Near *Portage, Aitkin Co., Minn.*; tile and pipe, marked 1898, lower edge of small poplars 400 meters from R. B. of river, 14 meters N. of State road, 40 meters above schoolhouse No. 21, 290 meters N. of Fred Anderson's house; about 23 miles above Aitkin, Minn.

P. B. M. Pat.—Near *Portage, Aitkin Co., Minn.*; tile and pipe, marked 1898, 7 meters from R. B. of river and 5 meters from State road, at log landing belonging to Pat Sanders, 1 mile above Pat Sanders's house, and 26.5 miles above Aitkin, Minn.; 24-inch elm E. 15 feet, 10-inch elm S. 7 feet; both blazed with a triangle facing P. B. M.

P. B. M. Sandy.—Near *Libby, Aitkin Co., Minn.*; tile and pipe, marked 1898, 8 meters from R. B. of river opposite the mouth of Sandy River; 6-inch balm of Gilead 2 meters SE., 15-inch basswood 2.8 meters S., 10-inch basswood 2.4 meters NW., 18-inch basswood 2 meters N., 8-inch box elder 4.5 meters NE.; all blazed with a triangle facing P. B. M.

P. B. M. Big Lagoon.—Near *Libby, Aitkin Co., Minn.*; a triangulation station tile and pipe, marked 1898, 5 meters E. of State road, on top of R. B. of creek draining swamp, 20 meters below center of bridge across creek, 60 meters above junction of State and Doray's roads, 120 meters from R. B. of what is known as Big Lagoon; 8-inch spruce 3 meters NE., blazed with a triangle; about 30.3 miles above Aitkin, Minn.

P. B. M. Midway.—Near *Libby, Aitkin Co., Minn.*; tile and pipe, marked 1898, on top of knoll covered with bowlders, 30 meters from R. B. of river, 179.9 meters from State road, 60 meters above mouth of creek, 1 300 meters below what is known as high bank on the river; high country on opposite side of river; 33.8 miles above Aitkin, Minn.

P. B. M. Wells.—Near *Libby, Aitkin Co., Minn.*; tile and pipe, marked 1898, on property of E. B. Wells, 10 meters from R. B. of river, 1 meter N. and 1 meter E. of NE. corner of Mr. Wells's house, which is Verdon post-office; it is  $1\frac{1}{2}$  meters SE. of 20-inch pine stump, 3 feet high, near corner of house; 36.3 miles above Aitkin, Minn.

P. B. M. Stone.—Near *Mississippi, Itasca Co., Minn.*; tile and pipe, marked 1898, 3 meters from R. B. of river, in edge of meadow; 196 meters above Frank Stone's abandoned house, which is 30 meters above mouth of creek; 125 meters E. of State road; 20-inch white oak S. 21 meters blazed with a triangle; 39 miles above Aitkin, Minn. Old abandoned house of Frank Stone torn down and new one erected 30 meters W. since P. B. M. was set.

P. B. M. Le Moon.—Near *Mississippi, Itasca Co., Minn.*; tile and pipe, marked 1898, 2 meters from top of R. B. lagoon, 4 meters E. of fence line around John Le Moon's house; State road is between fence and P. B. M.; 15 meters above Le Moon's house; about 41.5 miles above Aitkin, Minn.

P. B. M. Tiessen.—Near *Mississippi, Itasca Co., Minn.*; a triangulation station tile and pipe, marked 1898, between State road and R. B. of river, 12 meters from former and 20 meters from latter; 402 meters below John Tiessen's house, 100 meters below a cedar-pole bridge across ravine; charred stumps blazed, N. 22 feet, E. 6.8 feet, SE. 8.5 feet, W. 11.5 feet; about 45 miles above Aitkin, Minn.

P. B. M. Vicinity.—Near *Mississippi, Itasca Co., Minn.*; tile and pipe, marked 1898, 4 meters from top of bank of old lagoon, in vicinity of county line between Aitkin and Itasca counties; 5-inch oak NE. 25 feet, 9-inch oak N. 42 feet, 12-inch oak N. 60 feet; all blazed with triangles facing P. B. M.; 47.5 miles above Aitkin, Minn.

P. B. M. Shep.—Near *Mississippi, Itasca Co., Minn.*; a triangulation station tile and pipe, marked 1898,  $1\frac{3}{4}$  miles below Split Hand Creek, 5 meters from R. B. of river, on high bank 24 meters from State road; white pine stumps, 40-inch diameter E. 18 feet, 30-inch diameter N. 18 feet, 24-inch diameter W. 15 feet; all blazed with triangles facing P. B. M.; about 50 miles above Aitkin, Minn.

P. B. M. Split Hand.—Near *Verna, Itasca Co., Minn.*; a triangulation station tile and pipe, marked 1898, about 1 090 meters above Split Hand Creek, 800 meters above John Erwin's house, 6 meters from top of high bank, 105 meters above R. B. of river where high bank ends, 40 meters from road; about 52 miles above Aitkin, Minn.

P. B. M. Hamilton.—Near *Blackberry, Itasca Co., Minn.*; a triangulation station tile and pipe, marked 1898, 28 meters E. from road crossing State road and road from Little Cowhorn Lake and Cowhorn Lagoon and Hamilton's ranch, 4 meters from crossroad; about 54 miles above Aitkin, Minn.

P. B. M. Five Pines.—Near *Blackberry, Itasca Co., Minn.*; a triangulation station tile and pipe, marked 1898, on knoll 45 meters from State road NE. and near cluster of five white pines  $\frac{1}{2}$  mile above junction of State and Pokegama Lake roads, 375 meters above Edward Heinke's house; 13 meters N. of corner of fence; 30-inch white pine W. 21 feet, 30-inch white pine S. 35 feet, blazed with a triangle facing P. B. M.; about 57 miles above Aitkin, Minn.

P. B. M. Strawberry.—Near *Blackberry, Itasca Co., Minn.*; a triangulation station tile and pipe, marked 1898, on knoll 150 meters from R. B. of river,  $\frac{3}{4}$  mile E. of hill that Porcupine Triangulation Station is on, and about the same distance S. of Phil Zwick's house, about opposite B. M. Blackberry.

Porcupine Triangulation Station.—Near *Blackberry, Itasca Co., Minn.*; tile and pipe, marked 1898, 14-foot station over mark which is on high ridge 1 mile from river, R. B.; a large pond lies at foot of hill on upper side and another on lower side; two tall dead snags 60 meters SW.

Zwick Triangulation Station.—Near *Blackberry, Itasca Co., Minn.*; tile and pipe, marked 1898, near E. end of high ridge about 400 meters from R. B. of river,  $\frac{1}{2}$  mile above B. M. Blackberry, which is on L. B., 400 meters NW. of Phil Zwick's house.

T. B. M. 229.—*Blackberry, Minn.* (See App. 3, Report for 1903, p. 597.)

T. B. M. 230.—*Blackberry, Minn.* (See App. 3, Report for 1903, p. 597.)

B. M. Blackberry.—A tile and pipe 10 $\frac{1}{2}$  meters N. of center of track of Eastern Railway of Minnesota, 71 meters E. of milepost 105, about 70 meters W. of road crossing, and about 80 meters W. of *Blackberry, Minn.*, schoolhouse. A blazed white pine tree stands 1 meter N. of N. right of way fence about 11 meters E. of the pipe.

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN ST. CLOUD, MINN., AND WATERTOWN,  
S. DAK., 1904.

P. B. M. 238.—*St. Cloud, Stearns Co., Minn.* (See App. 8, Report for 1898, p. 779.) In 1904 the pipe was dug up, to reach the mark, and replaced with changed elevation.

P. B. M. 239.—*East St. Cloud, Stearns Co., Minn.* (See App. 8, Report for 1898, p. 779.) In 1904 access to the underground mark was had through the pipe and the cap replaced as before.

P. B. M. St. Cloud.—*St. Cloud, Stearns Co., Minn.* (See App. 8, Report for 1898, p. 780.) In 1904 the face of the bolt was badly injured, but the setting was undisturbed.

Hydrant 1.—*East St. Cloud, Stearns Co., Minn.*, on the NE. corner of Fifteenth street and Seventh avenue, 125 meters from the river and 100 meters above the lower wagon bridge. (Note 6, p. 127.)

Hydrant 2.—*St. Cloud, Stearns Co., Minn.*, on the NE. corner of Fifth avenue and Third street, W. of the river. (Note 6, p. 127.)

Hydrant 3.—*St. Cloud, Stearns Co., Minn.*, on the NE. corner of Fifth avenue and Fourth street S.; W. of the river. (Note 6, p. 127.)

Hydrant 4.—*St. Cloud, Stearns Co., Minn.*, on the NE. corner of Sixth avenue and Second street S.; W. of the river. (Note 6, p. 127.)

A.—*St. Cloud, Stearns Co., Minn.*, at the corner of Fifth avenue and the Great Northern Ry., 1 block W. of the river; in the brick wall of the Carter Building, on the side facing Fifth avenue; two bricks S. of the NE. corner, and two bricks above the stone foundation; 1.3 meters above the sidewalk. (Note 1, p. 126.)

B.—*St. Cloud, Stearns Co., Minn.*, about 1 mile W. of the river; in the granite wall of the Great Northern Ry. passenger station; 0.3 meter N. of the SE. corner; 30 meters S. of the main track, and 1 meter above the platform. (Note 4, p. 127.)

C.—4.2 kilometers W. of *St. Cloud, Stearns Co., Minn.*, on the Fergus Falls division of the Great Northern Ry., at the first grade crossing E. of the Sauk River; 15 meters N. of the railway track, at the right-of-way fence; 1 meter E. of a road running N. and S. (Note 2, p. 126.)

D.—4.8 kilometers W. of *St. Cloud, Stearns Co., Minn.*, on the Fergus Falls division of the Great Northern Ry.; on the right or east bank of the Sauk River; 13 meters from the river, and 2 meters above it; 55 meters S. of the railway track, and 2 meters below it; upon the highest point of a mass of red granite. (Note 4, p. 127.)

E.—300 meters W. of *St. Joseph, Stearns Co., Minn.*, on the Great Northern Ry.; 18 meters S. of the railway track, in the NE. corner of the wood lot belonging to Mrs. Loso; 1 meter from the fences, and 2 meters above the track. Trees were blazed, located as follows: 6-inch oak, SSW., 9.1 meters; 7-inch oak, W. by S., 7.3 meters; 8-inch oak, S., 5.2 meters. (Note 3, p. 126, except it was lettered by mistake U. S. S. W.)

F.—*Collegeville, Stearns Co., Minn.*, on a frame building belonging to St. Johns University, and used as express and ticket office; in the E. (granite) foundation wall, 30 meters S. of railway track, 17 meters W. of road to the University; 3 meters from the NE. corner, and  $\frac{1}{2}$  meter above ground. (Note 4, p. 127.)

G.—*Collegeville, Stearns Co., Minn.*, 55 meters E. of house belonging to Henry Broker, and 80 meters NE. of a building used as an express and ticket office; 37 meters E. of road to St. Johns University; 20 meters N. of the Great Northern Ry. track, at the right-of-way fence. (Note 3, p. 126.)

H.—3.3 kilometers E. of *Avon, Stearns Co., Minn.*, on the eastern edge of Kepper Lake, on culvert 17 (red sandstone) on the Great Northern Ry.; on the E. side of the culvert, on the upper face of the second stone from the top; 4.1 meters N. of the center of the railway track, and 0.9 meter below the top of the rail. (Note 5, p. 127.)

I.—*Avon, Stearns Co., Minn.*, upon the foundation (red sandstone) of the Great Northern Ry. water tank, 65 meters E. of Fourth street and 3 meters N. of the main track; upon the top stone of the W. pier, nearest the track; on the SW. corner of the stone, about 0.7 meter above the ballast. (Note 5, p. 127.) There is a similar cut in the SE. corner of the stone, not lettered, which is not the B. M.

J.—*Avon, Stearns Co., Minn.*, on the NE. corner of Fourth street and Pembina avenue, on Great Northern Ry. property; 7 meters E. of center of Fourth street and 10 meters N. of the center of Pembina avenue; 18 meters N. of Avon Hotel, and 42 meters S. of the main railway track. (Note 3, p. 126.)

K.—1.4 kilometers E. of *Albany, Stearns Co., Minn.*, on the Great Northern Ry.; at the cross roads, at the corner of a wood lot belonging to Joseph Lehner; at a grade crossing, 23 meters N. of the railway track,  $\frac{1}{2}$  meter outside the right-of-way fence; 22 meters W. of the center of the road crossing the track, and 10 meters S. of the center of the road parallel to the track, and  $\frac{1}{2}$  meter outside of the wood-lot fence. (Note 2, p. 126.)

L.—*Albany, Stearns Co., Minn.*, in the Kraker Building, on the NW. corner of Fourth and Railroad streets, 64 meters N. of the main railway track; in the dressed upper surface of the granite foundation wall, under the N. side of the show window facing on Fourth street; 4.4 meters N. of the front edge of the sidewalk on Railroad street, 1.9 meters W. of the front edge of the sidewalk on Fourth street, and 8 centimeters above the sidewalk; 6 centimeters S. of a granite pillar, 7 centimeters from the outer edge of the foundation, and 3.2 meters N. of the front corner of the building. (Note 4, p. 127.)

Hydrant 5.—*Albany, Stearns Co., Minn.*, at the corner of Fourth and Railroad streets, in front of the Kraker Building. (Note 6, p. 127.)

M.—*Freeport, Stearns Co., Minn.*, in the school building (of yellow brick) on Micklisch avenue, 200 meters E. of the railway depot; in the E. end of the granite sill at the front door; in the upper surface, 30 centimeters above the foundation wall, 4.5 centimeters from the E. side of the doorway, 3.5 centimeters from the front edge of the sill. (Note 4, p. 127.)

N.—*Freeport, Stearns Co., Minn.*, on Micklisch avenue, 50 meters W. of the railway depot; in the foundation of the town water tank, a tower of steel, about 40 meters high; in the NW. portion of the upper surface of the NW. pier, in red sandstone, 30 centimeters above the ground, and facing the street. (Note 1, p. 126.)

Hydrant 6.—*Freeport, Stearns Co., Minn.*, on the NW. corner of Micklisch avenue and Main street, in front of the Central Hotel; 40 meters N. of the main railway track. (Note 6, p. 127.)

O.—2.9 kilometers E. of *Melrose, Stearns Co., Minn.*, in a sandstone culvert on the Great Northern Ry.; 400 meters W. of Sauk River; 2 meters N. of center of the track, 1 meter below the top of the rail, and 1.3 meters above the ground; 0.09 meter W. of the E. edge of the W. abutment. (Note 5, p. 127.)

P.—*Melrose, Stearns Co., Minn.*, on Second street S., between Fifth and Sixth avenues E., 200 meters E. of the railway depot, 100 meters E. of the Cathedral and opposite a yellow brick house; at the right-of-way fence, 23 meters S. of the railway and 20 meters N. of traveled street. (Note 3, p. 126.)

City 1.—*Melrose, Stearns Co., Minn.*, at the NE. corner of St. Bonifacius Cathedral, on the SW. corner of Second street S. and Fifth avenue E.; the smooth, rounded, conical top of a granite post at the foot and NE. corner of the stairs leading to the N. entrance, being the most northern of six similar posts, about 1 meter in height, standing in a N. and S. line and forming a part of the masonry steps.

City 2.—*Melrose, Stearns Co., Minn.*, at the NE. corner of the Bank of Melrose building, on the corner of Main street and Fifth avenue E.; the top of the granite sill.

Q.—*Melrose, Stearns Co., Minn.*, on the SE. corner of Riverside avenue and Third avenue W., 70 meters N. of the railway, at the NW. corner of Dederich subdivision, and the land of H. Dederich; on street lines. The N. and S. quarter-section line through sec. 34, T. 126, R. 33, runs through center of the street W. of the B. M. (Note 3, p. 126.)

City 3.—*Melrose, Stearns Co., Minn.*; the center of the front-door sill (stone) of the City Hall.

City 4.—*Melrose, Stearns Co., Minn.*; the top of the rail at Third avenue, at the N. and S. quarter-section line through sec. 34, T. 126, R. 33.

R.—3.7 kilometers W. of *Melrose, Stearns Co., Minn.*, on the Great Northern Ry. bridge over Sauk River; 55 meters W. of the highway, near a large steel highway bridge; 3.3 meters S. of the center of the track, 0.4 meter below the top of the rail, 0.2 meter E. of the W. edge of the E. abutment (red sandstone), 2.7 meters from the ground. (Note 5, p. 127.)

S.—3.5 kilometers E. of *Sauk Center, Stearns Co., Minn.*, on the Great Northern Ry., at a grade crossing, 22 meters N. of the track, 10 meters E. of traveled road; at the corner of the highway line, the right-of-way fence, and scrub-oak land belonging to Nels Anderson and Albert Hatch. (Note 2, p. 126.)

T.—*Sauk Center, Stearns Co., Minn.*, in the E. end of the Great Northern Ry. depot (yellow brick); 4.5 meters N. of the SE. corner of depot, and 10 meters N. of the center of the main track; 0.12 meter S. of the N. end of the red sandstone window sill, 0.075 meter from the upper and the lower edges of the sill, in the center of the face of the sill; 1.3 meters above the level of the rail. (Note 4, p. 127.)

U.—*Sauk Center, Stearns Co., Minn.*, on the S. side of Railroad avenue, 75 meters S. of the main track, opposite a point 100 meters W. of the Great Northern Ry. depot; in the NE. corner of the lot of Joseph Parker, 20 meters E. of his house, 2 meters S. of an 8-inch box-elder tree. (Note 3, p. 126.)

Hydrant 7.—*Sauk Center, Stearns Co., Minn.*, at the corner of Fifth and Maple streets. (Note 6, p. 127.)

Hydrant 8.—*Sauk Center, Stearns Co., Minn.*, at the corner of Fifth and Elm streets. (Note 6, p. 127.)

Hydrant 9.—*Sauk Center, Stearns Co., Minn.*, at the corner of Sixth and Getty streets. (Note 6, p. 127.)

V.—4.2 kilometers E. of *West Union, Todd Co., Minn.*, at a grade crossing, 300 meters W. of Sauk River; 22 meters S. of the railway; in the NW. corner of the pasture belonging to Charles Calkins, at the corner of the right-of-way fence and the highway fence; 12 meters E. of traveled road. (Note 3, p. 126.)

W.—*West Union, Todd Co., Minn.*, 54 meters S. of the railway track and 50 meters W. of the station; at the NE. corner of the pasture belonging to Ed. Craig; 20 meters W. of main street, and 10 meters N. of a frame store. (Note 3, p. 126.)

X.—*West Union, Todd Co., Minn.*, in the most eastern of three brick piers in the grain elevator of Lee and Gingery, 14 meters S. of the railway track, 5 meters W. of the E. end of the building; 1.17 meter from the ground and 0.32 meter W. of the E. side of pier; the center of a diagonal cross on a copper bolt leaded into the N. face of the pier.

Y.—0.6 kilometer W. of *West Union, Todd Co., Minn.*, 35 meters N. of the railway track, 70 meters W. of the grade crossing, at the right-of-way fence, which is the highway line for the E. and W. road. (Note 2, p. 126, the post set in hard clay.)

Z.—3.4 kilometers E. of *Osakis, Douglas Co., Minn.*, at a grade crossing; 20 meters W. of the track of the Great Northern Ry. and 8 meters S. of the traveled road; at the corner of the right-of-way fence, the highway line and the land of K. Bjerkus. (Note 2, p. 126.)

A<sub>1</sub>.—3 miles S. of *Osakis, Douglas Co., Minn.*, in sec. 7, T. 127, R. 35; in the E. (granite) wall of the barn of C. A. Marthaler; 1.8 meters S. of the doorway, 2 meters N. of the S. end of the wall, and 1.1 meters above ground. (Note 4, p. 127.)

**Osakis Triangulation Station.**—3 miles S. of the town of *Osakis, Douglas Co., Minn.*, near the center of sec. 7, T. 127, R. 35, on the land owned by C. A. Marthaler, nearly  $\frac{1}{2}$  mile E. of his house, on a hill on the N. side of a wheat field. (Note 7, p. 127.)

**B<sub>1</sub>.**—*Osakis, Douglas Co., Minn.*, 50 meters E. of the station, 3 meters S. of the track, on the E. pier (sandstone) of the two next to the track, under the Great Northern Ry. water tank; 0.05 meter SW. of the NE. corner of the pier, at the level of the ground, being on the second stone from the top. (Note 5, p. 127.)

**C<sub>1</sub>.**—*Osakis, Douglas Co., Minn.*, 120 meters W. of the station and 70 meters S. of the Great Northern Ry. track; in the top surface of the granite sill at the NW. corner of Metcalf's saloon, on the SE. corner of Main and Second streets; 2.3 meters from the W. edge of the walk, 0.28 meter S. of the brick corner post, 0.1 meter E. of the front edge of the sill, 0.08 meter above the level of the sidewalk. (Note 4, p. 127.)

**D<sub>1</sub>.**—*Osakis, Douglas Co., Minn.*, in the building of the *Osakis Milling Co.*, on the NW. corner of Second street and the Great Northern Ry.; in the brickwork of the S. wall of the mill, 4.55 meters W. of the E. end of the building, 0.3 meter W. of the street line, which runs through the mill, 3.8 meters E. of the main doorway, 1 meter above the ground. (Note 1, p. 126.)

**E<sub>1</sub>.**—2.4 kilometers W. of *Osakis, Douglas Co., Minn.*, 3 meters N. of the Great Northern Ry. track, on the E. pier (sandstone) supporting the overhead highway bridge; 6 meters below the highway, 0.6 meter below the level of the rail, 0.07 meter SW. of the NE. corner of the pier, at the level of the ground. (Note 5, p. 127.)

**F<sub>1</sub>.**—1.8 kilometers E. of *Nelson, Douglas Co., Minn.*, 22 meters S. of the Great Northern Ry. track, at a grade crossing; at the highway line adjoining land owned by A. D. Hanson; 3 meters N. of the right-of-way fence and 10 meters E. of traveled road; 1 meter above the level of the rail. (Note 2, p. 126.)

**G<sub>1</sub>.**—*Nelson, Douglas Co., Minn.*, 60 meters E. of the railway station, 24 meters N. of the Great Northern Ry. track, 9 meters E. of the center of Nelson street, at the intersection of the street line, the right-of-way fence, and the SW. corner of the land of S. J. Miller, 50 meters SW. of his house. (Note 3, p. 126; set in hard clay.)

**H<sub>1</sub>.**—1.8 kilometers E. of *Alexandria, Douglas Co., Minn.*, at a grade crossing; 20 meters S. of the Great Northern Ry. track, at the intersection of the W. highway line, the railway fence, and the NE. corner of the land of the Great Northern Ry. leased by Capt. Schaefer, and used as a pasture. (Note 2, p. 126; set in hard clay.)

**Alexandria Triangulation Station.**—About  $1\frac{3}{4}$  miles E. of *Alexandria, Douglas Co., Minn.*, in the NE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of sec. 20, T. 128 N., R. 37 W., on land owned by A. J. Thompson, on wooded land on a ridge, 133 paces S. of his house, about 1 600 feet S. of Sixth street extended; 30 meters W. of the N. and S. road. (Note 7, p. 127.)

**Alexandria Reference Mark.**—About 36 meters NE. of Alexandria Triangulation Station, at the highway line, 8 meters W. of N. and S. traveled road; the top of the nail in the top of a terra-cotta pipe filled and surrounded with concrete.

**I<sub>1</sub>.**—*Alexandria, Douglas Co., Minn.*, 60 meters W. of the station and 70 meters E. of G street; in the E. pier (nearest the track of the Great Northern Ry.) under the water tank; 2.7 meters S. of the rail, 0.35 meter above the ground, 0.05 meter SW. of the NE. corner of the pier. (Note 5, p. 127.)

**J<sub>1</sub>.**—*Alexandria, Douglas Co., Minn.*, 1 meter W. of the W. line of G street, 35 meters N. of Third avenue, 2 meters inside of the NE. corner of the lot of E. G. Erickson, owner of the Alexandria Boat Works, 165 meters S. of the Great Northern Ry. track; set in fine gravel. (Note 3, p. 126.)

**K<sub>1</sub>.**—*Alexandria, Douglas Co., Minn.*, in the top surface of the sandstone sill in front of the store of F. E. and Geo. Raiter, on the E. side of G street; 24 meters N. of the N. line of Sixth avenue, 2.3 meters N. of the S. side of the building, which abuts on a yellow brick block; 3 meters S. of the center of the doorway, 0.08 meter from the outer edge of the sill, 0.07 meter above the level of the sidewalk. (Note 1, p. 126.)

**Alexandria Magnetic Station.**—*Alexandria, Douglas Co., Minn.*, in the school grounds, 20 meters W. of F street, 38 meters S. of Seventh street, 29 meters E. of the E. side of the school building; a shallow square between the letters U. and S. on the top of a marble post, projecting 4 inches above the ground, marked by a cross and the letters U. S. C. & G. S. The surface is fast being chipped away by school children.



L<sub>1</sub>.—*Alexandria, Douglas Co., Minn.*, about 30 meters W. of E street, in the SE. corner of the foundation wall (red sandstone) on the S. side of the county court-house; 0.18 meter W. of the corner, 1.13 meters above the ground, 0.8 meter below the brickwork, in the second course from the top. (Note 4, p. 127.)

City.—*Alexandria, Douglas Co., Minn.*; a deep scratch in the sandstone foundation of the county court-house; 0.38 meter below and 1.7 meters E. of B. M. L<sub>1</sub>. The elevation on the city datum was given as 53.28 feet. In this datum, which is about 25 years old, the level of Lake Agnes, N. of the city, was taken as zero. The several adjoining and connected lakes are at approximately the same level.

M<sub>1</sub>.—4.5 kilometers E. of *Garfield, Douglas Co., Minn.*, 24 meters N. of the Great Northern Ry. track, at a grade crossing; at the intersection of the E. highway line, the right-of-way fence, and the SW. corner of the land of Peter Johnson; 8 meters E. of traveled road, 3.2 meters above the level of the rail; set in fine gravel and sand. (Note 2, p. 126.)

N<sub>1</sub>.—*Garfield, Douglas Co., Minn.*, 45 meters S. of the Great Northern Ry. track, 28 meters W. of the depot, 12 meters W. of Main street prolonged; in the NE. corner of lot of Fred. Bartel, 15 meters N. of his house; set in hard clay. (Note 3, p. 126.)

O<sub>1</sub>.—4.7 kilometers E. of *Brandon, Douglas Co., Minn.*, on the W. pier of the overhead highway bridge, 0.2 meter SE. of the NW. corner of the pier; 2.2 meters S. of the rail, at the level of the ground, 0.4 meter below the rail, and 8 meters below the highway. (Note 5, p. 127.)

P<sub>1</sub>.—3 kilometers E. of *Brandon, Douglas Co., Minn.*, 3 meters N. of the main track of the Great Northern Ry.; 700 meters E. of a grade crossing and 400 meters W. of an embankment through a small lake; upon the highest point of a flinty granite boulder, about 1 meter square and 1.5 meters deep. (Note 5, p. 127.)

Q<sub>1</sub>.—2.5 kilometers E. of *Brandon, Douglas Co., Minn.*, 20 meters N. of the Great Northern Ry. track, at a grade crossing; at the intersection of the W. highway line, the right-of-way fence, and the SE. corner of the land of Gunder Kylo, 1.2 meters above the level of the rail; set in hard clay. (Note 2, p. 126.)

R<sub>1</sub>.—*Brandon, Douglas Co., Minn.*, 10 meters E. of the station, 17 meters S. of the Great Northern Ry. track; at the intersection of the E. line of the main street, right-of-way fence, and the NW. corner of the lot of the Brandon Flouring Mills; 80 meters W. of the mill, at the level of the rail, and adjoining the street; set in clay. (Note 3, p. 126.)

S<sub>1</sub>.—*Evansville, Douglas Co., Minn.*, in the section of the town called Johnson's First Addition, 130 meters SW. of the railway station, in the NE. corner of the public school grounds; at the S. line of Second avenue, 35 meters W. of Railroad street. (Note 3, p. 126.)

T<sub>1</sub>.—*Evansville, Douglas Co., Minn.*, 100 meters S. of the railway station, 15 meters E. of the E. line of Railroad street, in the N. wall (yellow brick) of the town hall; 1.5 meters E. of the NW. corner, 1.8 meters above the ground. (Note 1, p. 126.)

U<sub>1</sub>.—*Erdahl (Cork P. O.), Grant Co., Minn.*, on the land of T. Tobiason, of Ashby, at the E. line of the main street, 58 meters S. of the railway, at a point 70 meters W. of the depot; 7 meters E. of the line of travel, 17 meters NE. of the frame store of A. J. Oxelgren, 24 meters S. of a grain elevator. (Note 2, p. 126.)

V<sub>1</sub>.—*Thorsborg, Grant Co., Minn.*, Sanford Township, on NW.  $\frac{1}{4}$  of sec. 13; 110 meters N. and 60 meters W. of the railway station, at the SW. corner of a pasture belonging to Henry Lajord; at the NE. corner of the crossroads, 10 meters E. and 5 meters N. of the line of travel. (Note 2, p. 126.)

W<sub>1</sub>.—4 kilometers E. of the station at *Elbow Lake, Grant Co., Minn.*, on the Great Northern Ry.; 1.8 kilometers E. of the crossing of the Minneapolis, St. Paul and Sault Ste. Marie Ry., 150 meters W. of a bridge over a slough, 300 meters E. of the NW. corner of a cultivated field belonging to Harold Thorsen, of Elbow Lake; at the right-of-way fence, 20 meters S. of the track; a copper bolt leaded into the center of the top surface of a block of red Kasota sandstone, 0.5 meter square and 0.7 meter long, set flush with the ground, marked U. S. B. M.

X<sub>1</sub>.—*Elbow Lake, Grant Co., Minn.*, in the N. end of the S. doorsill (sandstone) of the First National Bank building, 1.8 meters N. of the S. side of the building; 0.1 meter from the E. or front edge of the sill, 0.08 meter S. of the brickwork, 0.4 meter above the sidewalk, 0.5 meter N. of the center of the doorway. (Note 1, p. 126.)

Y<sub>1</sub>.—*Elbow Lake, Grant Co., Minn.*, at the SE. corner of the Bank of Elbow Lake building, on the back or W. edge of the cornerstone (pink sandstone) under a stone porch pillar; the bottom of a horizontal niche, 13 millimeters square, in a broad sloping bevel, 0.06 meter N. of the SW. corner of the stone; 0.7 meter W. of the W. line of the main street, 0.4 meter above the sidewalk.

Z<sub>1</sub>.—1.3 kilometers S. of *Elbow Lake, Grant Co., Minn.*, and 3.2 kilometers E. of station Elbow Lake on the Great Northern Ry., 22 meters SW. of the crossing of the Great Northern and the Minneapolis, St. Paul and Sault Ste. Marie Rys.; 20 meters S. of the track of the former, and 14 meters W. of that of the latter, 2 meters S. of the corner of the right-of-way fences; in the NE. corner of the pasture belonging to John Warwick. (Note 2, p. 126.)

Elbow Triangulation Station.—2 miles E. and 1½ miles N. of the town of *Elbow Lake, Grant Co., Minn.*, 10 meters W. of the N. and S. traveled road and 3.5 kilometers N. of the Great Northern Ry.; on grassy land on a hill on the E. side of sec. 3, T. 129, R. 42; on land owned by Niels Olson, living ¾ mile N. on the NE. corner of the section. (Note 7, p. 127, the square hole being W. of the station point.)

A<sub>2</sub>.—3 kilometers W. of the town of *Elbow Lake, Grant Co., Minn.*, 45 meters S. of station Elbow Lake on the Great Northern Ry., in the NE. corner of the meadow belonging to Chas. Dahl, at the highway line, 15 meters S. of the traveled road where it turns N. to cross the track. (Note 11, p. 127.)

B<sub>2</sub>.—3.5 kilometers E. of *Hereford, Grant Co., Minn.*, 1.8 kilometers S. of the town of Wendell, 25 meters N. of the Great Northern Ry. track; at the right-of-way fence, W. highway line, and SE. corner of the meadow belonging to Arthur Smith. (Note 2, p. 126.)

C<sub>2</sub>.—4 kilometers W. of *Hereford, Grant Co., Minn.*, 15 meters S. of the Great Northern Ry. track, 780 meters W. of the grade crossing; at the right-of-way line, W. side of the private roadway crossing the track, and NW. corner of the cultivated field belonging to John Watry. (Note 2, p. 126.)

D<sub>2</sub>.—*Tintah, Traverse Co., Minn.*, 65 meters S. and 75 meters E. of the railway station, 70 meters SE. of frame church building, and 75 meters S. of Hotel Tintah; at the E. line of the alley, and the NW. corner of the lot of Peter Putnam. (Note 3, p. 126.)

E<sub>2</sub>.—*Tintah, Traverse Co., Minn.*, 125 meters N. and 40 meters E. of the Great Northern Ry. station, in the S. wall of the engine house of the Imperial Elevator Co.; 2 meters W. of the SE. corner of the building, 2.7 meters E. of the doorway, 1.2 meters above the ground, in yellow brick. (Note 4, p. 127.)

F<sub>2</sub>.—3.2 kilometers N. of *Tintah, Traverse Co., Minn.*, 18 meters E. of the Great Northern Ry. track, 0.5 kilometer S. of the crossing of the "Soo" Line Ry.; at the E. highway line and the NW. corner of the pasture belonging to John Wilkie. (Note 3, p. 126.)

G<sub>2</sub>.—0.8 kilometer W. of *Yarmouth, Wilkin Co., Minn.*, and 4.5 kilometers S. of the town of Campbell; 38 meters S. of the Great Northern Ry. track, at S. highway line and the NW. corner of the lot belonging to N. W. Ware, being 12 meters S. of the line of travel, 8 meters W. of the private road, 22 meters NW. of the house of Mr. Ware; in a row of willow trees, 80 meters E. of a running stream. (Note 3, p. 126.)

H<sub>2</sub>.—2.8 kilometers N. of the town of *Tenney, Wilkin Co., Minn.*, 25 meters N. of the Great Northern Ry. track, at a grade crossing; at W. highway line, right-of-way line, and the SE. corner of the field belonging to F. W. Hungerford; 7 meters W. of the line of travel. (Note 2, p. 126.)

I<sub>2</sub>.—*Childs, Wilkin Co., Minn.*, 1.7 kilometers E. of Bois de Sioux River, which is the State line between Minnesota and North Dakota; 90 meters S. of the Great Northern Ry. track, 10 meters E. of the line of travel; at E. highway line, 3 meters N. of the SW. corner of the lot belonging to D. D. Waite. (Note 3, p. 126.)

A.—1 kilometer N. of *Fairmount, Richland Co., N. Dak.*, 12 meters E. of the Chicago, Milwaukee and St. Paul Ry., 37 meters S. of the Great Northern Ry.; at the right-of-way lines and the NW. corner of the cultivated field belonging to Rebecca E. Bostwick; 8 meters S. of the traveled highway, at the S. line of same. (Note 25, p. 128.)

B.—6 kilometers N. of *Fairmount, Richland Co., N. Dak.*, at the NW. corner of the NE. ¼ of sec. 5, T. 130 N., R. 47 W., being 14 meters E. of the Chicago, Milwaukee and St. Paul Ry. track, and 13 meters S. of the traveled road, on the right-of-way and highway lines. (Note 25, p. 128.)

979 W.—Near *Fairmount, Richland Co., N. Dak.*, a U. S. Geological Survey B. M., described thus: "T. 130 N., R. 48 W., sec. 1, NE. corner of; SW. corner of crossroads; iron post stamped 979." The post was found much disturbed and in an unstable condition. It was reset in cement at its old location.

971 W.—In Minnesota, near *Fairmount, Richland Co., N. Dak.*, a U. S. Geological Survey B. M., described thus: "T. 130 N., R. 47 W., sec. 3, NE. corner of; iron post stamped 971." The post was found as described, at the NW. corner of the crossroads.

969 W.—In Minnesota, near *Fairmount, Richland Co., N. Dak.*, a U. S. Geological Survey B. M., described thus: "T. 131 N., R. 47 W., sec. 10, SE. corner of; NW. corner of crossroads; iron post stamped 969."

Foss Triangulation Station.—2.5 miles N. of *Childs, Wilkin Co., Minn.*, almost at  $\frac{1}{4}$  corner of W. side of sec. 1, T. 130 N., R. 47 W., on land at the W. edge of wheat field rented by M. E. Foss, living  $\frac{3}{4}$  mile ESE. (Note 7, p. 127.)

Foss Reference Mark.—Near *Childs, Minn.*, at the SE. corner of NE.  $\frac{1}{4}$  sec. 2, on land owned by Ed. Joy; 20 meters W. of Foss Triangulation Station, on the opposite side of the highway. (Note 7, p. 127.)

J<sub>2</sub>.—8.5 kilometers N. and 1.6 kilometers W. of *Childs, Wilkin Co., Minn.*, at the NE. corner of sec. 27, T. 131 N., R. 47 W.; at the SW. corner of the crossroads, 2 meters S. of the S. highway line, on the W. highway line. (Note 25, p. 128.)

C.—*Fairmount, Richland Co., N. Dak.*, 100 meters E. of the Chicago, Milwaukee and St. Paul Ry. depot, at the front doorway of the store of R. W. Dougherty, 3.4 meters S. of S. street line; on the doormill (sandstone), 0.4 meter S. of the front edge, 0.2 meter W. of the framing at the E. side of the doorway, 0.1 meter above the sidewalk. (Note 1, p. 126.)

D.—*Fairmount, Richland Co., N. Dak.*, at the Bank of Fairmount, 120 meters E. of the Chicago, Milwaukee and St. Paul Ry. depot; 3 meters N. of N. street line, 5 meters E. of the front doorway in the E. oblique face of the SE. corner stone (of pink sandstone); the lower surface of a recess, 0.1 meter N. of the SE. corner of the stone, 0.6 meter from the top of the stone, 0.1 meter from the bottom.

E.—1.1 kilometers N. of *Blackmer, Richland Co., N. Dak.*, 20 meters W. of the Chicago, Milwaukee and St. Paul Ry. track, at the right-of-way fence and the NE. corner of the pasture belonging to D. E. Dibble; 400 meters S. of the slough, being near the center of the E. side of the SW.  $\frac{1}{4}$  of sec. 17, T. 129 N., R. 47 W. (Note 25, p. 128.)

F.—2 kilometers S. of *Blackmer, Richland Co., N. Dak.*, 16 meters E. of the Chicago, Milwaukee and St. Paul Ry. track, 4 meters W. of the right-of-way fence, 1.3 kilometers N. of the grade crossing; on a granite boulder, 1.3 meters long, 0.8 meter wide, and 0.4 meter deep, set in the earth half its depth, 4 meters SE. of a large boulder. (Note 5, p. 127.)

G.—3.3 kilometers S. of *Blackmer, Richland Co., N. Dak.*, at a grade crossing, 19 meters E. of the Chicago, Milwaukee and St. Paul Ry. track; at N. highway line, the right-of-way fence, and the SW. corner of the pasture, 400 meters N. of the grade crossing of the N. and S. road. (Note 25, p. 128.)

A.—*White Rock, Roberts Co., S. Dak.*, 75 meters W. of the Chicago, Milwaukee and St. Paul Ry. depot, in the sandstone sill of the Globe building, on the N. side of Main street, 3.1 meters E. of the SW. corner of the building, 0.9 meter W. of the center of the front doorway, 0.15 meter N. of the front edge of the sill, 0.13 meter from the framing, and 0.15 meter above the sidewalk. (Note 5, p. 127.)

B.—*White Rock, Roberts Co., S. Dak.*, 190 meters W. of the Chicago, Milwaukee and St. Paul Ry. depot, at the front doorway of the store of S. E. Oscarson, on the N. side of the main street, 8 meters E. of the SW. corner of the building; in the top surface of the sandstone sill, 1.2 meters W. of the center of the doorway, 0.15 meter N. of the front edge, 0.15 meter from framing, and 0.4 meter above sidewalk. (Note 1, p. 126.)

C.—*White Rock, Roberts Co., S. Dak.*, 80 meters S. of the depot, 1.6 meters W. of the W. rail of the side track, and 10 meters W. of the main track of the Chicago, Milwaukee and St. Paul Ry., in the granite foundation of the grain elevator of the Crown Elevator Co., in the sloping surface of the extreme NE. corner, 0.12 meter above the ground, 1 meter below the framing, 1.1 meters E. of the W. edge of the pier. (Note 5, p. 127.)

K<sub>2</sub>.—In Minnesota, 1.5 kilometers S. of *White Rock, Roberts Co., S. Dak.*, on the S. side of sec. 10, T. 128 N., R. 47 W., near the SE. corner of the section; 19 meters E. of the Chicago, Milwaukee and St. Paul Ry. track, at the right-of-way fence, N. highway line, and the SW. corner of the pasture, 1.1 meters above the level of the rails. (Note 2, p. 126.)

L<sub>2</sub>.—In Minnesota, 2.6 kilometers S. of *White Rock, Roberts Co., S. Dak.*, near the center of the SE.  $\frac{1}{4}$  of sec. 15, T. 128 N., R. 47 W., 14 meters E. of the track of the Chicago, Milwaukee and St. Paul Ry., 1.2 meters below the level of the rail, 1.2 kilometers S. of the grade crossing; in a granite boulder, 0.9 meter square and 0.5 meter deep. (Note 5, p. 127.)

M<sub>2</sub>.—9 kilometers N. of *Wheaton, Traverse Co., Minn.*, near the center of the S. side of the SW.  $\frac{1}{4}$  of sec. 23 T., 128 N., R. 47 W., 20 meters E. of the Chicago, Milwaukee and St. Paul Ry. tracks, 14 meters N. of the traveled road; at the right-of-way fence, the highway line, and the SW. corner of the cultivated field. (Note 25, p. 128.)

Oscarson Triangulation Station.—Near *White Rock, Roberts Co., S. Dak.*, in the NW.  $\frac{1}{4}$ , sec. 24, T. 128 N., R. 47 W., on land owned by S. E. Oscarson; 90 meters NW. of dwelling house, 8 meters N. of the private road, in a grass plot, 25 meters W. of a hedge of trees. (Note 7, p. 127, the B. M. being S. of the center of station.)

Oscarson Reference Mark.—Near *White Rock, Roberts Co., S. Dak.*, in a hedge 25 meters E. of Oscarson Triangulation Station. (Note 7, p. 127.)

N<sub>2</sub>.—*Wheaton, Traverse Co., Minn.*, at the NW. corner of Erickson, Hellekson & Co.'s hardware store, at the corner of Broadway and Minnesota streets; in the sloping bevel of the top edge of the E. face of the corner stone; 0.04 meter S. of the front face of the stone, 0.4 meter above the sidewalk, 0.5 meter E. of the W. side of the building. (Note 5, p. 127.)

City.—*Wheaton, Traverse Co., Minn.*, at the extreme SE. corner of the Bank of Wheaton, on the N. side of Broadway street, 1 block E. from Minnesota street; a square in outline on the top of the lower granite step, 0.02 meter NW. of the SE. corner, 0.15 meter above the sidewalk.

O<sub>2</sub>.—*Wheaton, Traverse Co., Minn.*, on the sandstone doorsill of a store owned by Mr. Christianson, on the NE. corner of Broadway and Minnesota streets; at the E. end of the sill, 0.15 meter from the front edge, 0.4 meter above the sidewalk. (Note 1, p. 126.)

P<sub>2</sub>.—5 kilometers S. of *Wheaton, Traverse Co., Minn.*, in the W. side of the SW.  $\frac{1}{4}$  of sec. 33, T. 127 N., R. 46 W., 25 meters W. of the Chicago, Milwaukee and St. Paul Ry. track; at the grade crossing, 9 meters SE. of the line of travel, at right-of-way fence, highway line, and the NW. corner of the waste lot, 4 meters N. of a large stone heap. (Note 2, p. 126.)

Q<sub>2</sub>.—1.6 kilometers N. of *Dumont, Traverse Co., Minn.*, 15 meters E. of the track of Chicago, Milwaukee and St. Paul Ry., 9 meters N. of the traveled road; at the highway line, the right-of-way fence, and the SW. corner of land of Mr. Haas, near the SE. corner of sec. 10, T. 126 N., R. 47 W. (Note 2, p. 126.)

R<sub>2</sub>.—*Dumont, Traverse Co., Minn.*, on Main street, 66 meters E. of Chicago, Milwaukee and St. Paul Ry. track and 20 meters N. of the station, in the W. wall of the yellow brick store belonging to K. Kwurm; 0.55 meter N. of the SW. corner and 1.3 meters above the ground. (Note 1, p. 126.)

S<sub>2</sub>.—*Dumont, Traverse Co., Minn.*, 24 meters E. of the Chicago, Milwaukee and St. Paul Ry. track, 15 meters S. of the station, 1.8 meters E. of the adjacent rail in the side track; on the upper surface of the foundation (sandstone) at the NW. corner of the National Elevator Co.'s grain elevator, 0.2 meter above the ground, 6 centimeters E. of the W. edge of the stone and 10 centimeters S. of the N. edge of the stone. (Note 5, p. 127.)

T<sub>2</sub>.—4.8 kilometers S. of *Dumont, Traverse Co., Minn.*, 17 meters W. of Chicago, Milwaukee and St. Paul Ry. track, 9 meters S. and 8 meters E. of the lines of travel, at the intersection of the highway lines and right-of-way fence; near the NE. corner of sec. 3, T. 125 N., R. 46 W., adjoining land of John Donahue. (Note 2, p. 126.)

U<sub>2</sub>.—*Collis, Traverse Co., Minn.*, 11 meters E. of Chicago, Milwaukee and St. Paul Ry. track on the granite foundation of a grain elevator of the Miller Elevator Co.; 0.31 meter N. of the extreme SW. corner of the stone, 0.03 meter E. of W. edge of the stone, 0.18 meter above the ground, 0.15 meter N. of the SW. corner of the framing, and 0.10 meter below it. (Note 5, p. 127.) The letters U. S. B. M. were cut on the adjacent wood with a chisel.

V<sub>2</sub>.—2 kilometers S. of *Collis, Traverse Co., Minn.*, near the NW. corner of sec. 23, T. 125 N., R. 46 W., 14 meters E. of Chicago, Milwaukee and St. Paul Ry. track, 8 meters S. of the line of travel, at the intersection of the highway line and the right-of-way fence; upon a block of granite, 0.4 meter by 0.6 meter by 0.7 meter, set flush with the ground; 0.15 meter E. of the W. side of the stone and 0.08 meter S. of the N. side. (Note 8, p. 127.)

W<sub>2</sub>.—5.2 kilometers N. of *Graceville, Bigstone Co., Minn.*, near the NE. corner of sec. 27, T. 125 N., R. 46 W.; 12 meters W. of Chicago, Milwaukee and St. Paul Ry. tracks, 9 meters S. and 8 meters E. of the lines of travel, at the intersection of the highway lines and the right-of-way fence; upon a block of granite, 0.5 meter in size. (Note 8, p. 127.)

X<sub>2</sub>.—3.6 kilometers N. of *Graceville, Bigstone Co., Minn.*, near the NE. corner of sec. 34, T. 125 N., R. 46 W.; 15 meters W. of Chicago, Milwaukee and St. Paul Ry. track, 10 meters S. of the line of travel; at the right-of-way fence and the intersecting highway lines; adjoining land of Wm. Rice. (Note 2, p. 126.)

Y<sub>2</sub>.—*Graceville, Bigstone Co., Minn.*, 12 meters W. of the center of Second street, midway between St. Peter and St. Paul streets; near the center of the E. side of lot 10, in the NE. corner of the public-school grounds, 0.9 meter S. of N. fence and 0.5 meter W. of E. fence. (Note 3, p. 126.)

City.—*Graceville, Bigstone Co., Minn.*, at the SE. corner of Fourth street and Studdart avenue, on the top surface of the sandstone water table of Brennan Brothers' store; 2.4 meters W. of the center of the doorway; a cross in outline 0.6 meter E. of the W. wall, 9 centimeters S. of the front edge of stone, and 0.4 meter above the sidewalk.

Z<sub>2</sub>.—*Graceville, Bigstone Co., Minn.*, at the entrance near the SE. corner of Graceville House, belonging to A. E. Heymann, on the NE. corner of Third street and Studdart avenue; in the center of the sandstone doorsill, 0.2 meter N. of front edge of the sill; 0.1 meter above sidewalk, and 1.7 meters W. of SE. corner of the building. (Note 1, p. 126.)

A<sub>3</sub>.—*Graceville, Bigstone Co., Minn.*, 120 meters S. of the station, 20 meters W. of Chicago, Milwaukee and St. Paul Ry. track, on the grain elevator of the Monarch Elevator Co.; 0.4 meter S. of the extreme NE. corner of the building; on a stone 7 centimeters above the ground, 6 centimeters W. of the E. edge of the stone. The letters U. S. B. M. were chiseled in the adjoining wood. (Note 5, p. 127.)

B<sub>3</sub>.—1.6 kilometers S. of *Graceville, Bigstone Co., Minn.*, near the SE. corner of sec. 9, T. 124 N., R. 46 W.; 8 meters E. of Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 10 meters N. of the line of travel, 11 meters W. of the right-of-way fence, at the highway line, 0.2 meters below the level of the rail. (Note 3, p. 126.)

C<sub>3</sub>.—6.2 kilometers S. of *Graceville, Bigstone Co., Minn.*, in the SW.  $\frac{1}{4}$  of sec. 28, T. 124 N., R. 46 W.; 15 meters E. of Chicago, Milwaukee and St. Paul Ry. track, at right-of-way fence, 325 meters W. of the house of F. R. Rothwell, 9 meters N. of a private road leading to it. (Note 2, p. 126.)

D<sub>3</sub>.—8 kilometers S. of *Graceville, Bigstone Co., Minn.*, in the NW.  $\frac{1}{4}$  of sec. 4, T. 123 N., R. 46 W.; 14 meters E. of Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 6 meters W. and 13 meters S. of the lines of travel, adjoining the land of L. E. Daly, 345 meters S. of his house. (Note 25, p. 128.)

E<sub>3</sub>.—3 kilometers N. of *Clinton, Bigstone Co., Minn.*, in the SW.  $\frac{1}{4}$  of sec. 4, T. 123 N., R. 46 W.; 18 meters W. of Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 11 meters N. of the line of travel; at the highway line, right-of-way fence and SE. corner of the field of Jos. Rothwell. (Note 2, p. 126.)

F<sub>3</sub>.—*Clinton, Bigstone Co., Minn.*, on the S. side of the main street, 50 meters E. of the main railway track; under the city water tank, in the bevel of the upper and western edge of the northern pier of the western pair, 9 centimeters S. of the N. edge of the stone, 2 centimeters E. of the W. edge, 25 centimeters above ground. (Note 5, p. 127.)

G<sub>3</sub>.—*Clinton, Bigstone Co., Minn.*, on the N. side of the main street, 80 meters E. of the main railway track, in the front sandstone doorsill of the Erickson Building; 9 centimeters N. of the front edge of the sill, 0.75 meter E. of the center of the doorway, 0.15 meter above the sidewalk. (Note 1, p. 126.)

H<sub>3</sub>.—2 kilometers S. of *Clinton, Bigstone Co., Minn.*, in the SE.  $\frac{1}{4}$  of sec. 21, T. 123 N., R. 46 W.; 17 meters E. of the Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 8 meters N. of the line of travel; at the intersection of the highway line, the right-of-way fence, and the SW. corner of a cultivated field belonging to M. Vigness. (Note 2, p. 126.)

I<sub>3</sub>.—7.5 kilometers N. of *Ortonville, Bigstone Co., Minn.*, in the SE.  $\frac{1}{4}$  of sec. 16, T. 122 N., R. 46 W.; 17 meters W. of Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 7 meters N. of the line of travel; at the intersection of the highway line, right-of-way fence, and the SE. corner of a cultivated field belonging to Claus Carlson. (Note 2, p. 126.)

J<sub>3</sub>.—4 kilometers N. of *Ortonville, Bigstone Co., Minn.*, near the center of the N. side of sec. 33, T. 122 N., R. 46 W.; 7.4 meters W. of Chicago, Milwaukee and St. Paul Ry. track, 240 meters S. of a grade crossing; upon the highest point of a granite boulder, 1.3 meters by 1.8 meters by 0.5 meter. (Note 8, p. 127.)

K<sub>3</sub>.—2.6 kilometers N. of the court-house at *Ortonville, Bigstone Co., Minn.*, at the NW. corner of the NE.  $\frac{1}{4}$  of sec. 4, T. 121 N., R. 46 W.; 20 meters E. of Chicago, Milwaukee and St. Paul Ry. tracks, at a grade crossing and the SE. corner of the crossroads, 8 meters E. and 6 meters S. of the lines of travel. (Note 2, p. 126.)

I<sub>3</sub>.—*Ortonville, Bigstone Co., Minn.*, on the granite terrace wall of the county court-house, 64 meters S. of the main entrance; in the top of the SW. corner, 1.1 meters E. of the front edge of the wall, 0.06 meter N. of the S. edge, 1.55 meters above ground. (Note 8, p. 127.)

U. S. E. 1.—*Ortonville, Bigstone Co., Minn.*, established by the Corps of Engineers, U. S. Army, in their survey of Bigstone Lake, and described thus: "A boat spike in a horizontal blaze in the root of an oak tree 55 feet SW. of the SW. cornerstone of block 1."

U. S. E. 2.—Established by the Corps of Engineers, U. S. Army, and described thus: "The center of the top of a square granite cut stone set at the NW. corner of block 1, city of *Ortonville, Bigstone Co., Minn.*; the stone is on the lake beach at the foot of the bank." A copper bolt (note 3, p. 126) was cemented in a drill hole in the center of the post and used as the B. M. in 1904.

U. S. E. 3.—Established by the Corps of Engineers, U. S. Army, and described thus: "The monument is on the fence line along the N. side of Madison avenue, *Ortonville, Bigstone Co., Minn.*, about 200 feet E. from the railway tracks and about 140 feet SW. from the center of the intersection of Madison avenue and Front or First street. It is the extreme high-water lake level." In 1904 it was marked in the same manner as U. S. E. 2.

D.—In South Dakota, 560 meters W. of the railway station of *Bigstone City, Grant Co., S. Dak.*, and 2 kilometers W. of Ortonville Station on the road leading to Bigstone City; at the SW. corner of the crossroads, 5 meters W. and 6 meters S. of the lines of travel, and 200 meters N. of the main line of the Chicago, Milwaukee and St. Paul Ry. (Note 3, p. 126.)

E.—4 kilometers W. of *Bigstone City, Grant Co., S. Dak.*, 15 meters N. of the Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 8 meters E. of the line of travel; at the intersection of the highway line, right-of-way line, and the SW. corner of a cultivated field. (Note 3, p. 126.)

F.—5.4 kilometers W. of *Bigstone City, Grant Co., S. Dak.*, near the SE. corner of the NE.  $\frac{1}{4}$  of sec. 23, T. 121 N., R. 47 W.; 9 meters S. of the Chicago, Milwaukee and St. Paul Ry. track, at a grade crossing, 5 meters E. of the line of travel; at the intersection of the highway and right-of-way lines, and the NW. corner of a cultivated field belonging to Aug. Lueck. (Note 2, p. 126.)

G.—9.5 kilometers E. of *Milbank, Grant Co., S. Dak.*, near the NW. corner of the NW.  $\frac{1}{4}$  of sec. 34, T. 121 N., R. 47 W.; 14 meters N. of the Chicago, Milwaukee and St. Paul Ry. track, 36 meters E. of a grade crossing; on the right-of-way line, 8 meters SE. of the line of travel, at the SW. corner of a cultivated field. (Note 2, p. 126.)

H.—0.8 kilometer E. of the railway station at *Milbank, Grant Co., S. Dak.*, 16 meters S. of Chicago, Milwaukee and St. Paul Ry. track, 8 meters W. of the center of Eastman street, at the intersection of the right-of-way and street lines and NE. corner of the lot belonging to W. H. Gaynor. (Note 3, p. 126.)

I.—*Milbank, Grant Co., S. Dak.*, 180 meters S. of the railway station, in the sandstone doorsill at the N. entrance of the Masonic Building; 0.25 meter E. of the front edge of the sill, 1.2 meters S. of the N. wall of the building, 0.25 meter N. of the framing, and 0.05 meter above the sidewalk. (Note 1, p. 126.)

J.—2.2 kilometers W. of *Milbank, Grant Co., S. Dak.*, near the center of the E. side of the NE.  $\frac{1}{4}$  of sec. 11, T. 120 N., R. 49 W.; 15 meters S. of the Chicago, Milwaukee and St. Paul Ry. track, at grade crossing, 5 meters W. of the line of travel; at the intersection of the highway line, right-of-way fence, and NE. corner of a field of C. D. Fairchild. (Note 2, p. 126.)

K.—1.7 kilometers E. of *Twinbrooks, Grant Co., S. Dak.*, 14 meters N. of the Chicago, Milwaukee, and St. Paul Ry. track, 176 meters N. of the SE. corner of sec. 12, T. 120 N., R. 50 W.; 11 meters W. of the E. line of the section, at the intersection of the highway and the right-of-way lines and the SE. corner of a cultivated field belonging to J. Q. Thayer. (Note 2, p. 126.)

L.—*Twinbrooks, Grant Co., S. Dak.*, 140 meters W. of the depot, 15 meters N. of the main railway track, in the granite foundation of the Farmers' Elevator; at the SE. corner of the upper surface, 4 centimeters NW. of the corner, and 1.2 meters above ground; marked by U. S. B. M. in the wood above. (Note 5, p. 127.)

M.—*Stockholm, Grant Co., S. Dak.*, 11 meters SE. of the NW. corner of the SW.  $\frac{1}{4}$  of sec. 23, T. 119 N., R. 50 W.; 134 meters S. and 36 meters E. of the railway station, on land belonging to Aug. Berg, 8 meters E. and 9 meters S. of intersecting roads on highway lines. (Note 2, p. 126.)

N.—*Southshore, Codington Co., S. Dak.*, 43 meters W. of the station, and 5 meters N. from the main railway track; under the railway water tank, on the southern pier (red sandstone) of the eastern pair; 0.1 meter W. of the E. side, 0.25 meter N. of the S. side, and 0.03 meter above ground. (Note 5, p. 127.)

O.—*Southshore, Codington Co., S. Dak.*, in the N. wall (yellow brick) of Johnston and Chervenka's store, 15 meters W. of Main street, 9 meters S. of Railroad street, and 90 meters S. of the main railway track; 1.35 meters above the sidewalk, 0.75 meter W. of the E. edge of the wall. (Note 1, p. 126.)

Mound Triangulation Station.— $2\frac{1}{2}$  miles S. of *Southshore, Codington Co., S. Dak.*, upon the top of a high knoll, called Punished Womans Mound, about the center of sec. 34, T. 119 N., R. 51 W.; on land of John Koehler, on grassy land, 28 meters N. by E. from the NW. corner of a fenced pasture. (Note 7, p. 127, except the station mark is the B. M.)

Mound Reference Mark.— $2\frac{1}{2}$  miles S. of *Southshore, Codington Co., S. Dak.*, 89.386 meters NW. of Mound Triangulation Station. The center is the mark.

P.—2 kilometers E. of *Forestville, Codington Co., S. Dak.*, 7 kilometers by railroad W. of *Southshore*, 390 meters N. of the SW. corner of sec. 32, T. 119 N., R. 51 W.; 15 meters E. of the traveled road, 22 meters N. of the Great Northern Ry. track. (Note 2, p. 126.)

Q.—8 miles by road N. of *Watertown, Codington Co., S. Dak.*, at the SW. corner of sec. 21, T. 118 N., R. 52 W.; 8 meters E. and N. of intersecting roads, 100 meters W. of the Great Northern Ry. track, in the SW. corner of a lot, 38 meters from a house rented by Rev. R. Polzin. (Note 2, p. 126.)

R.—5.8 kilometers N. of *Watertown, Codington Co., S. Dak.*, 33 meters E. of the SW. corner of sec. 7, T. 117 N., R. 52 W.; 13 meters N. of the traveled road, 16 meters E. of the Great Northern Ry. track, near the right-of-way and highway lines, in the SW. corner of the lot of C. R. Siebert. (Note 2, p. 126.)

S.—2 kilometers N. of *Watertown, Codington Co., S. Dak.*, near the SE. corner of sec. 24, T. 117 N., R. 53 W.; 44 meters W. of the Great Northern Ry. track, 7 meters N. of a private road to Whistler Brothers abattoir; at the SE. corner of the fenced pasture, 37 meters W. of the roadway, and 108 meters E. from the abattoir. (Note 2, p. 126.)

T.—*Watertown, Codington Co., S. Dak.*, at the city hall, in the W. end of the front doorsill, 0.4 meter S. of the front edge of the sill, 1 meter W. of the center of the doorway; 0.2 meter E. of the W. pillar, 1 meter above and 1.5 meters S. of the sidewalk on the S. side of Kemp avenue. (Note 1, p. 126.)

City 1.—*Watertown, Codington Co., S. Dak.*, at the SE. corner of the Mellett Block, Kemp avenue and Oak street, on the upper surface of the foundation; square in outline, 0.07 meter N. of the S. edge of the stone, 0.09 meter W. of the E. edge, 0.45 meter above the sidewalk, 3.4 meters S. of a doorway.

City 2.—*Watertown, Codington Co., S. Dak.*, at the county court-house, in the upper bevel at the extreme NE. corner of the water table; a square hole, 0.02 meter SW. of the NE. corner, and 0.03 meter NE. of the brickwork, 0.4 meter above ground.

Watertown Magnetic Station.—*Watertown, Codington Co., S. Dak.*, in the SE. corner of the court-house grounds, 1.5 meters N. of the N. line of Warner avenue, 2 meters W. of the W. line of Maple street; on top of a stone post, lettered U. S. C. & G. S.; a square in outline between the letters U. and S.

U.—*Watertown, Codington Co., S. Dak.*, in the NE. corner of the court-house grounds, 1.5 meters S. of the S. line of Codington avenue, and 1.5 meters W. of the W. line of Maple street; an iron post set in a grass lawn in sandy soil. (Note 2, p. 126.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS FROM WATERTOWN, S. DAK., TO SIOUX CITY, IOWA, 1906.

T.—*Watertown, Codington Co., S. Dak.* (See above.)

City 1.—*Watertown, Codington Co., S. Dak.* (See above.)

City 2.—*Watertown, Codington Co., S. Dak.* (See above.)

Magnetic Station.—*Watertown, Codington Co., S. Dak.* (See above.)

U.—*Watertown, Codington Co., S. Dak.*, in the NE. corner of the court-house grounds, 1.5 meters S. of the S. line of Codington avenue, and 1.5 meters W. of the W. line of Maple street; set in a grass lawn, in sandy soil. (Note 2, p. 126.)

V.—*Watertown, Codington Co., S. Dak.*, near the center of the western side of the SW.  $\frac{1}{4}$  sec. 31, T. 117, R. 52; on the northern one of the W. pair of piers under the Great Northern Ry. water tank; 500 meters S. of Kemp avenue, 12 meters W. of the track; 4 centimeters E. of the W. edge of the stone and 5 centimeters S. of the N. edge, 23 centimeters above ground. (Note 5, p. 127.)

W.—2.2 kilometers E. of the town of *Grover*, *Codington Co., S. Dak.*, near the center of the W. side of lot 3, of the W.  $\frac{1}{2}$  sec. 30, T. 116, R. 53, 17 meters N. of the railway track; 9 meters E. of the roadway, and 1.9 meters below the rails; 1 meter N. and E. of highway and railway lines. (Note 34, p. 128.)

X.—*Grover*, *Codington Co., S. Dak.*, near the center of the E. side of the NE.  $\frac{1}{4}$  sec. 35, T. 116, R. 54; 366 meters E. of the railway station, 40 meters S. of the track; 15 meters W. and 10 meters S. of the roadways, 5 meters S. of the corner and on the E. line of a pasture belonging to John Zimprecht; 1 meter below the rails. (Note 34, p. 128.)

Y.—About  $3\frac{1}{2}$  miles E. of *Hazel*, *Hamlin Co., S. Dak.*, near the center of the SW.  $\frac{1}{4}$  sec. 4, T. 115, R. 54; 3.9 meters N. of the Great Northern Ry. track; and 20 meters S. of a roadway beside the tracks; a square in outline on the highest point of the extreme N. rim of an iron tile set solidly in rough masonry, 0.9 meter below the rails and 0.7 meter above the ground.

Z.—*Hazel*, *Hamlin Co., S. Dak.*, at the entrance of the First State Bank, at the SW. corner of Main street and the N. and S.  $\frac{1}{4}$  section line through the center of sec. 24, T. 115, R. 55; 0.13 meter E. of the W. brick wall; 1.13 meters W. of the center of the doorway, and 11 meters W. of the NE. corner of the building; a right-angled piece of white tiling, 50 by 35 millimeters, in the extreme NW. corner of the mosaic; 0.42 meter S. of the front edge of the top step and 0.67 meter above the sidewalk.

A<sub>1</sub>.—*Hazel*, *Hamlin Co., S. Dak.*, at the SW. corner of the Merchants Hotel, 21 meters W. of the NW. corner of Main street and the N. and S.  $\frac{1}{4}$  section line through the center of sec. 24, T. 115, R. 55; in the bevel on the front upper edge of the pink sandstone water table, 3.74 meters W. of the center of the doorway, and 0.08 meter E. of the W. side of the building; at the N. edge of and 0.34 meter above the sidewalk. (Note 5, p. 127.)

B<sub>1</sub>.—*Hazel*, *Hamlin Co., S. Dak.*, 200 meters W. of the railway station, near the center of the E. side of the NW.  $\frac{1}{4}$  sec. 24, T. 115, R. 55, 75 meters S. of the main track, on the E. line of and 5 meters S. of the NE. corner of a pasture belonging to Samuel Conway; 8 meters W. of the roadway and 1.6 meters below the rails. (Note 34, p. 128.)

C<sub>1</sub>.—3 kilometers W. of *Hazel*, *Hamlin Co., S. Dak.*, 10 meters WSW. of the NE. corner of sec. 27, T. 115, R. 55; 65 meters S. of the track, 2 meters W. of the corner and on the N. line of a cultivated field. (Note 2, p. 126.)

D<sub>1</sub>.—5.7 kilometers W. of *Hazel*, *Hamlin Co., S. Dak.*, near the center of the S. side of the SW.  $\frac{1}{4}$  sec. 28, T. 115, R. 55; 27 meters E. of the grade crossing; 20 meters S. of the railway tracks, 32 meters N. of the roadway on the S. section line, 10 meters N. of a roadway along the tracks, 1.8 meters below the rails. (Note 2, p. 126.)

E<sub>1</sub>.—In *Hamlin Co., S. Dak.*, 3 kilometers W. of *Vienna*, *Clark Co.*, near the center of the SE.  $\frac{1}{4}$  sec. 31, T. 115, R. 55; on the western one of the S. pair of piers under the Great Northern Ry. water tank; 3.3 meters S. of the track, 4 centimeters N. of the S. edge, and 4 centimeters W. of the E. edge; on pink sandstone, 0.4 meter below the rails. (Note 5, p. 127.)

F<sub>1</sub>.—1 kilometer E. of *Vienna*, *Clark Co., S. Dak.*, on the E. line of the SE.  $\frac{1}{4}$  sec. 1, T. 114, R. 56; 35 meters N. of the Great Northern Ry. track; 6 meters W. of the roadway; 5 meters N. of the corner, and on the E. line of a pasture, 1 meter above the rails. (Note 34, p. 128.)

G<sub>1</sub>.—*Vienna*, *Clark Co., S. Dak.*, 38 meters S. of the Chicago, Milwaukee and St. Paul Ry. station, 9 meters W. of the main track; 60 meters S. of the N. line of sec. 12, T. 114, R. 56; on the sandstone foundation under the NE. corner of a grain elevator belonging to S. Y. Hyde; 0.45 meter S. of the NE. corner of the stone, 2 centimeters W. of the eastern edge, 0.15 meter above ground, 0.15 meter below the rails. (Note 5, p. 127.)

H<sub>1</sub>.—In *Hamlin Co., S. Dak.*, 3.6 kilometers S. of *Vienna*, *Clark Co.*, on the N. line of sec. 19, T. 114, R. 55, near the NW. corner of the NE. quarter section; 21 meters W. of the Chicago, Milwaukee and St. Paul Ry., 4 meters S. of the highway, 1 meter N. of the N. line of and 3 meters W. of the NE. corner of a cultivated field belonging to William Dede; 0.5 meter above the rails. (Note 2, p. 126.)

I<sub>1</sub>.—1.9 kilometers N. of *Bryant*, *Hamlin Co., S. Dak.*, 16 meters ENE. of the quarter section post on the W. line of sec. 8, T. 113, R. 55, 6 meters N. and 15 meters E. of the quarter section lines; 23 meters E. of the Chicago, Milwaukee and St. Paul Ry., 1 meter NE. of the SW. corner of a pasture belonging to F. H. Guse; 0.4 meter above the rails. (Note 2, p. 126.)

J<sub>1</sub>.—1.7 kilometers N. of *Bryant*, *Hamlin Co., S. Dak.*, 240 meters S. of the NE. corner of the SE.  $\frac{1}{4}$  sec. 7, T. 113, R. 55; 13 meters W. of the Chicago, Milwaukee and St. Paul Ry., on the northern one of the western pair of piers under a water tank; 0.07 meter S. of the northern edge, 0.10 meter W. of the eastern edge, 0.12 meter above ground at the level of the rails, in pink sandstone. (Note 5, p. 127.)



Section Corner 1.—1.3 kilometers N. of *Bryant, Hamlin Co., S. Dak.*, between secs. 7, 8, 17, and 18, T. 113, R. 55; a raised smooth square in the center of a pink jasper post at the level of the ground and the center of the crossroads.

K<sub>1</sub>.—*Bryant, Hamlin Co., S. Dak.*, at the NE. corner of Main street and the railway property, 142 meters S. of the station and 16.5 meters E. of the Chicago, Milwaukee and St. Paul Ry., on the sandstone foundation at the SW. corner of an apartment house belonging to S. Y. Hyde; 14 meters N. of the street on the E. and W. line through the center of the SW.  $\frac{1}{4}$  sec. 17, T. 113, R. 55; 4 centimeters E. of the W. edge of the stone, 10 centimeters N. of the S. edge, 9 centimeters above ground. (Note 5, p. 127.)

L<sub>1</sub>.—*Bryant, Hamlin Co., S. Dak.*, in the tiling at the SE. side of the entrance to the First State Bank, in the extreme eastern corner of the pattern, 0.85 meter W. of the E. side of the building, 0.70 meter above the sidewalk, and 1.12 meters SE. of the center of the doorway; the center of a triangular piece of maroon tiling, 4 centimeters on each edge, the only piece of that size and shape; 0.12 meter SW. of and 0.11 meter N. of the stonework; 1.62 meters SW. from the front edge of the top step.

M<sub>1</sub>.—1 kilometer S. of *Bryant, Hamlin Co., S. Dak.*, 75 meters E. of the quarter section corner which is on the W. line of sec. 20, T. 113, R. 55; 11 meters W. of the Chicago, Milwaukee and St. Paul Ry., 14 meters N. of the highway, on the right-of-way line; 0.5 meter below the rails. (Note 34, p. 128.)

Section Corner 2.—3.7 kilometers S. of *Bryant, Hamlin Co., S. Dak.*, between secs. 29, 30, 31, and 32; T. 113, R. 55; in the center of the crossroads; in the center of the top of a pink jasper post, at the level of the ground. (Note 5, p. 127.)

N<sub>1</sub>.—*Erwin, Kingsbury Co., S. Dak.*, 230 meters S. of the railway station, 130 meters N. of the S. line of sec. 21, T. 112, R. 55, 16 meters W. of the Chicago, Milwaukee and St. Paul Ry., on the SE. corner of the pink sandstone foundation under the Stone Elevator Co's. grain elevator; 4 centimeters N. of the S. edge, 6 centimeters W. of the E. edge, 0.58 meter above ground. (Note 5, p. 127.)

O<sub>1</sub>.—1.8 kilometers S. of *Erwin, Kingsbury Co., S. Dak.*, 113 meters W. of the SE. corner of sec. 28, T. 112, R. 55; 16 meters E. of the Chicago, Milwaukee and St. Paul Ry., 5 meters N. of the highway, on the highway line, 2.5 meters E. of the right-of-way line, 0.3 meter above the rails. (Note 34, p. 128.)

P<sub>1</sub>.—3.5 kilometers S. of *Erwin, Kingsbury Co., S. Dak.*, near the NE. corner of lot 4, of the NW.  $\frac{1}{4}$  sec. 3, T. 111, R. 55; 12 meters W. of the Chicago, Milwaukee and St. Paul Ry., 10 meters S. of the highway on the N. line of the section at the level of the rails. (Note 2, p. 126.)

Q<sub>1</sub>.—2 kilometers N. of *Lake Preston, Kingsbury Co., S. Dak.*, near the center of lot 2, of the E.  $\frac{1}{2}$  sec. 35, T. 111, R. 55, 600 meters S. of the road on the N. line of the section, 13 meters W. of the Chicago, Milwaukee and St. Paul Ry., 150 meters W. of the lake bank, 10 meters SW. of a highway, 0.5 meter above the rails. (Note 34, p. 128.)

R<sub>1</sub>.—*Lake Preston, Kingsbury Co., S. Dak.*, at the SW. corner of the Temple Block, owned by L. I. Olston and O. D. Thorsnes, on the E. side of Main street; in the top bevel of the smooth, cubical (pink sandstone) corner stone, on the NW. corner of the stone, next the brick work, 6 centimeters inside the sidewalk line, 0.45 meter above the sidewalk, and 0.60 meter N. of the SW. corner of the building. (Note 5, p. 127.)

S<sub>1</sub>.—*Lake Preston, Kingsbury Co., S. Dak.*, in the doorsill (sandstone) at the SW. entrance to the city hall; 0.1 meter E. of the brickwork at the W. side of the doorway; 4 centimeters above and 5 centimeters N. of the sidewalk. (Note 1, p. 126.)

Preston.—*Lake Preston, Kingsbury Co., S. Dak.*, on the E. side of Main street, one block S. of the Chicago and Northwestern Ry., in the SW. corner of the city park, 1 meter E. and 2 meters N. of sidewalk lines; a native granite rock, 4 inches square, at the level of the ground, marked with a cross, 18 millimeters NE. of the center.

T<sub>1</sub>.—1 kilometer S. of *Lake Preston, Kingsbury Co., S. Dak.*, on the N. line of the NE.  $\frac{1}{4}$  sec. 12, T. 110, R. 55; 12 meters E. of the Chicago, Milwaukee and St. Paul Ry., 10 meters S. of the highway, on the right-of-way line, 2.5 meters S. of the highway line, 0.3 meter above the rails. (Note 2, p. 126.)

U<sub>1</sub>.—6 kilometers S. of *Lake Preston, Kingsbury Co., S. Dak.*, near the center of the N. side of lot 6, of the N.  $\frac{1}{2}$  sec. 30, T. 110, R. 54; 12 meters W. of the Chicago, Milwaukee and St. Paul Ry., 10 meters N. of the highway, on the right-of-way line, 2 meters N. of the highway line, 0.5 meter below the rails. (Note 2, p. 126.)

Hansen Triangulation Station.—4.4 miles S. of *Lake Preston, Kingsbury Co., S. Dak.*, in the center of sec. 26, T. 110, R. 55; in the SE. corner of the schoolhouse yard, dist. No. 4, just W. of the land of H. H. Hansen; 3.04 meters N. and 3.40 meters W. of the S. and E. school yard fences. (Note 9, p. 127.)

Hansen Reference Mark.—4.4 miles S. of *Lake Preston, Kingsbury Co., S. Dak.*, 133.4 meters from Hansen Triangulation Station, and 68 meters W. of the center of the section, at the S. road fence running E. and W. through the center of the section, at the corner formed by partition fence running S. (Note 9, p. 127.)

Section Corner 3.—5 kilometers S. of *Lake Preston, Kingsbury Co., S. Dak.*, between secs. 24 and 25, T. 110, R. 55; and secs. 19 and 30, T. 110, R. 54, in the center of the crossroads; the center of the top of a granite boulder, flush with the ground.

V<sub>1</sub>.—*Oldham, Kingsbury Co., S. Dak.*, 165 meters N. of the railway station, 18 meters W. of the Chicago, Milwaukee and St. Paul Ry.; a square cut on a gray quartz boulder forming the foundation under the NE. corner of the Farmers' Elevator; 0.04 meter W. of the E. edge, 0.35 meter S. of the corner, and 0.2 meter above ground.

W<sub>1</sub>.—*Oldham, Kingsbury Co., S. Dak.*, upon the E. end of the S. window sill (red sandstone) of the First State Bank; 1 centimeter W. and 2 centimeters S. of the brickwork at the E. side of the window; at the N. sidewalk line, and 0.7 meter above it. (Note 13, p. 127.)

X<sub>1</sub>.—2 kilometers S. of *Oldham, Kingsbury Co., S. Dak.*, on the S. line of sec. 27, T. 109, R. 54; 12 meters E. of the Chicago, Milwaukee and St. Paul Ry., 11 meters N. of the highway, on the right-of-way line, 3 meters N. of the highway line, 0.2 meter below the rails. (Note 34, p. 128.)

Y<sub>1</sub>.—In *Lake Co.*, 5 kilometers S. of *Oldham, Kingsbury Co., S. Dak.*, on the E. line of sec. 3, T. 108, R. 54; 12 meters S. of the Chicago, Milwaukee and St. Paul Ry., 10 meters W. of the highway, on the right-of-way line, 2 meters W. of the highway line, at the level of the rails. (Note 2, p. 126.)

Z<sub>1</sub>.—*Ramona, Lake Co., S. Dak.*, on the sandstone foundation of the S. Y. Hyde elevator, 85 meters S. of the railway station; on the fourth course above ground, at the SE. corner. (Note 5, p. 127.)

A<sub>2</sub>.—*Ramona, Lake Co., S. Dak.*, 260 meters S. of the railway station, 15 meters N. of the quarter section road through sec. 32, T. 108, R. 53; 14 meters E. of the main track; on a granite rock in situ, exposed 0.2 by 0.5 meter, 0.1 meter above ground. (Note 5, p. 127.)

B<sub>2</sub>.—1.2 kilometers S. of *Ramona, Lake Co., S. Dak.*, 14 meters E. of the railway, 192 meters E. of the SW. corner of sec. 33, T. 108, R. 53; 8 meters N. of the S. line of that section, 2 meters N. and 1 meter E. of the adjacent fences. (Note 34, p. 128.)

C<sub>2</sub>.—4.1 kilometers S. of *Ramona, Lake Co., S. Dak.*, 1 047 meters S. of the N. line of sec. 9, T. 107, R. 53; 8 meters E. of the railway, 7 meters N. of a private road, and 0.4 meter below the rail. (Note 2, p. 126.)

D<sub>2</sub>.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, 270 meters, 15° N. of W. of the SE. corner of sec. 22, T. 107, R. 53; 101 meters N. of the S. line of the section, 14 meters W. of the railway; on small boulder, 0.6 by 0.4 by 0.3 meter, set flush with the ground, 1 meter E. of the fence and 1.1 meters below the rail. (Note 5, p. 127.)

Section Corner 4.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, between secs. 21, 22, 27, 28, T. 107, R. 53; on a small boulder. (Note 5, p. 127.)

Section Corner 5.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, between secs. 20, 21, 28, 29, T. 107, R. 53; on a small boulder. (Note 5, p. 127.)

Section Corner 6.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, between secs. 19, 20, 29, 30, T. 107, R. 53; on a small boulder. (Note 5, p. 127.)

E<sub>2</sub>.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, 14 meters, 30° W. of S. of the NE. corner of sec. 25, T. 107, R. 54; 11 meters S. and 9 meters W. of road, 1.5 meter W. of the fence; a square in relief on a rock in situ, 0.3 by 0.1 by 0.2 meter above ground.

Section Corner 7.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, between secs. 23, 24, 25, 26, T. 107, R. 54; on a small boulder. (Note 5, p. 127.)

Crane Reference Mark.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, in the SE. corner of sec. 21, T. 107, R. 54; at the fence corner, 7 meters N. and W. of roads. (Note 9, p. 127.)

Crane Triangulation Station.—8 kilometers S. of *Ramona, Lake Co., S. Dak.*, near the center of the SE.  $\frac{1}{4}$ , sec. 21, T. 107, R. 54, on the land of Geo. V. Crane; on the N. edge of a dense growth of trees and bushes, 50 meters W. of the NE. corner of the wood lot. (Note 9, p. 127.)

F<sub>2</sub>.—3.3 kilometers NW. of *Madison, Lake Co., S. Dak.*, 13 meters E. of the railway, 8 meters E. of the road, on the W. line of the SW.  $\frac{1}{4}$  sec. 1, T. 106, R. 53; 1 meter W. of the fence and 0.7 meter below the rails. (Note 2, p. 126.)

G<sub>2</sub>.—*Madison, Lake Co., S. Dak.*, 1.3 kilometers W. of the railway station, 17 meters N. of the N. railway track, 8 meters W. of the street on the E. line of sec. 12, T. 106, R. 53; in the E. fence line, 6 meters N. of the SE. corner of a young grove owned by W. R. Walker. (Note 34, p. 128.)

H<sub>2</sub>.—*Madison, Lake Co., S. Dak.*, at the NW. entrance to the building occupied by the Bank of South Dakota; on the N. end of the fourth step, 0.07 meter E. of the front edge, 0.6 meter above the sidewalk at the N. edge of the stone. (Note 13, p. 127.)

City 2.—*Madison, Lake Co., S. Dak.*, at the SW. entrance to the building occupied by the Bank of South Dakota; on the N. end of the first step, 0.1 meter above and W. of the sidewalk. (Note 13, p. 127.)

City 3.—*Madison, Lake Co., S. Dak.*, on the jasper foundation of the Lake Park Hotel, at the SE. corner, at the level of the sidewalk; on the SW. line of the basement window, 0.4 meter SE. of the stonework. (Note 13, p. 127.)

I<sub>2</sub>.—*Madison, Lake Co., S. Dak.*, on the NW. corner of the Hundemer Block, Egan avenue and Fourth street, a triangular shelf in the upper bevel of the sandstone cornerstone, next the brickwork, at the extreme corner, 0.6 meter above the sidewalk.

J<sub>2</sub>.—3.5 kilometers E. of *Madison, Lake Co., S. Dak.*, 244 meters S. of the NW. corner of sec. 10, T. 106, R. 52; 11 meters E. of the W. line of the section, 14 meters N. of the railway; in the fence line, 4 meters E. of the corner. (Note 2, p. 126.)

K<sub>2</sub>.—5.5 kilometers E. of *Madison, Lake Co., S. Dak.*, 11 meters N. of the railway, 339 meters E. of the road on the W. line of the NW  $\frac{1}{4}$ , sec. 11, T. 106, R. 52; in a red quartz rock, 0.4 by 0.4 meter; set at the level of the ground, 0.5 meter below the rail. (Note 5, p. 127.)

L<sub>2</sub>.—*Wentworth, Lake Co., S. Dak.*, 440 meters W. of the railway station, 15 meters S. of the railway, 4 meters W. of the E. line of sec. 8, T. 106, R. 51; a copper bolt in a boulder, 1.1 by 0.5 by 0.2 meter, set 2 meters S. of the NE. corner and on the E. line of a cultivated field, 0.3 meter below the rail.

M<sub>2</sub>.—*Wentworth, Lake Co., S. Dak.*, on the jasper foundations of the Abraham and Shultz elevator, 178 meters E. of the railway station, 13 meters W. of the street, on the quarter section line, 24 meters S. of the main track; at the NE. corner of the foundation at the level of the ground. (Note 13, p. 127.)

N<sub>2</sub>.—1.8 kilometers E. of *Wentworth, Lake Co., S. Dak.*, 500 meters E. of the SW. corner of sec. 10, T. 106, R. 51; 8 meters N. of the S. line of the section, 13 meters N. of the railway; in a pasture, 1 meter N. of the fence at the level of the rails. (Note 2, p. 126.)

O<sub>2</sub>.—*Colman, Moody Co., S. Dak.*, on the NW. corner of the jasper foundation of Snyder's elevator, 100 meters W. of the railway station, 14 meters S. of the main track; on a rough shelf, 0.7 meter above ground, 0.3 meter E. of the NW. corner, 0.2 meter below the woodwork. (Note 5, p. 127.)

P<sub>2</sub>.—3 kilometers E. of *Colman, Moody Co., S. Dak.*, 14 meters S. of the railway, 17 meters N. of the road on the S. line of the SE  $\frac{1}{4}$ , sec. 12, T. 106, R. 50; 0.8 meter above the rails. (Note 2, p. 126.)

Q<sub>2</sub>.—4 kilometers E. of *Colman, Moody Co., S. Dak.*, 17 meters S. of the railway, 4 meters W. of the road on the E. line of the SE  $\frac{1}{4}$ , sec. 12, T. 106, R. 50; 0.5 meter W. and 1.5 meters S. of the NE. corner of a cultivated field; in a flint boulder, 1.0 by 0.4 by 0.2 meter, 0.6 meter above the rails. (Note 5, p. 127.)

R<sub>2</sub>.—5 kilometers E. of *Colman, Moody Co., S. Dak.*, 14 meters W. of the railway, 38 meters S. of the road on the N. line of the NE  $\frac{1}{4}$ , sec. 18, T. 106, R. 49; 27 meters S. of the crossing and 0.4 meter below the rails. (Note 2, p. 126.)

S<sub>2</sub>.—6 kilometers E. of *Colman, Moody Co., S. Dak.*, 29 meters N. of the railway, 6 meters E. of the road on the W. line of the NW  $\frac{1}{4}$ , sec. 17, T. 106, R. 49; 0.5 meter S. of the fence, 0.5 meter E. of the corner adjacent to a cultivated field owned by Geo. M. Smith; in a boulder, 0.8 by 0.4 by 0.4 meter. (Note 5, p. 127.)

T<sub>2</sub>.—5 kilometers SW. of *Egan, Moody Co., S. Dak.*, 348 meters N. of the road on the S. line of the SW  $\frac{1}{4}$ , sec. 23, T. 106, R. 49; 6 meters E. of the railway; on a sandstone boulder in situ, 1.5 by 1.2 by 0.8 meter above ground. (Note 5, p. 127.)

U<sub>2</sub>.—7 kilometers SW. of *Egan, Moody Co., S. Dak.*, 14 meters E. of the railway, 12 meters S. of the road on the N. line of the NE  $\frac{1}{4}$ , sec. 2, T. 105, R. 49; on the N. line, 1 meter E. of the corner of a cultivated field owned by S. J. Hively. (Note 2, p. 126.)

Section Corner 8.—2.2 kilometers N. of *Trent, Moody Co., S. Dak.*, between secs. 1, 2, 11, 12, T. 105, R. 49; on a jasper post. (Note 5, p. 127.)

V<sub>2</sub>.—*Trent, Moody Co., S. Dak.*, in the sandstone foundation of the W. W. Cargill elevator, 120 meters S. of the railroad station, 18 meters W. of the main track; at the SE. corner, 0.4 meter above ground. (Note 5, p. 127.)

W<sub>2</sub>.—3.8 kilometers S. of *Trent*, *Moody Co.*, *S. Dak.*, 12 meters E. of the track, 9 meters S. of the road on the N. line of the SE.  $\frac{1}{4}$ , sec. 25, T. 105, R. 49; 610 meters S. of the railway bridge over the Big Sioux River, at the level of the rails. (Note 2, p. 126.)

X<sub>2</sub>.—*Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, in the jasper foundation of the First National Bank, at the SW. side of the entrance; a square in relief, 0.06 meter above the sidewalk, 0.22 meter W. of the stonework, 0.03 meter NE. of the SW. edge of the stone, 0.05 meter SE. of the NW. edge, 2 meters SW. and 1 meter below the center of the main doorway.

City 1.—*Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, the center of the lower bar of the letter L in the word National, cast in the front doorsill of the First National Bank.

Y<sub>2</sub>.—*Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, at the W. side of the main doorway to the M. A. Dieson Building, 1.35 meters W. of the center of the doorway; an orange square mosaic, 0.03 by 0.03 meter, 0.5 meter S. of and 0.08 meter above the sidewalk, being the most northwesterly piece of that size and color in the pattern.

City 2.—*Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, the center of the stem of the letter R in the word Foundry, cast in the iron sill of the W. doorway to the Union Block.

Z<sub>2</sub>.—*Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, on the SE. corner of the jasper foundation of the McCaull-Webster elevator; 7 meters N. of the main railway track, 11 meters W. of the street, 0.8 meter above ground. (Note 13, p. 127.)

A<sub>3</sub>.—1.5 kilometers W. of *Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, on the S. pier (sandstone) of the R. R. bridge over the Big Sioux River, 0.47 meter S. of the N. face of the pier, 0.12 meter E. of the W. face; 1.9 meters W. of the track, 1.1 meters below the rails. (Note 5, p. 127.)

B<sub>3</sub>.—3 kilometers SW. of *Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, 15 meters W. of the railway, 7 meters N. of the road on the S. line of sec. 17, T. 104, R. 49; 1 meter N. and 0.5 meter E. of the fences, 0.7 meter below the rail. (Note 2, p. 126.)

Section Corner 9.—4.5 kilometers S. of *Dell Rapids*, *Minnehaha Co.*, *S. Dak.*, between secs. 20, 21, 28, and 29, T. 104, R. 49; in a small boulder. (Note 5, p. 127.)

C<sub>3</sub>.—*Baltic*, *Minnehaha Co.*, *S. Dak.*, 500 meters S. of the railway station on the NW. corner of the jasper foundations of the most southerly elevator, 6 meters E. of the main track, on the second course below the woodwork, 0.7 meter S. of the N. edge, 0.45 meter above ground. (Note 5, p. 127.)

D<sub>3</sub>.—1.5 kilometers S. of *Baltic*, *Minnehaha Co.*, *S. Dak.*, 12 meters N. of the road on the S. line of sec. 5, T. 103, R. 49; 14 meters E. of the railway, 2 meters N. of the corner in the W. line of a cultivated field owned by John Langness; 0.6 meter below the rails. (Note 2, p. 126.)

E<sub>3</sub>.—3 kilometers S. of *Baltic*, *Minnehaha Co.*, *S. Dak.*, on the lines of secs. 8 and 17, T. 103, R. 49; 33 meters W. of the railway, 7 meters S. of the road, on the N. line of a cultivated field, owned by John Vollan; 2 meters W. of the corner, 0.7 meter below the rails. (Note 2, p. 126.)

F<sub>3</sub>.—4 kilometers south of *Baltic*, *Minnehaha Co.*, *S. Dak.*, 31 meters SW. of the railway; on a jasper rock set in the center of the crossroads, 0.9 meter below the rails. (Note 5, p. 127.)

G<sub>3</sub>.—*Renner*, *Minnehaha Co.*, *S. Dak.*, in the jasper foundations at the SW. corner of the Petersen elevator, 6 centimeters N. and 3 centimeters E. of the corner, 9 centimeters above ground. (Note 5, p. 127.)

H<sub>3</sub>.—*Renner*, *Minnehaha Co.*, *S. Dak.*, on the S. line of sec. 9, T. 102, R. 49; 21 meters E. of the railway, 14 meters N. of the road; on a jasper rock, set 3 meters E. and 4 meters N. of the SW. corner of a lot owned by L. Renner; 0.7 meter below the rails. (Note 5, p. 127.)

I<sub>3</sub>.—4 kilometers S. of *Sioux Falls*, *Minnehaha Co.*, *S. Dak.*, 5 meters S. of the road on the N. line of sec. 4, T. 101, R. 49; 23 meters E. of the railway, on the N. line of a cultivated field, 8 meters E. of the corner, 0.5 meter below the rails. (Note 2, p. 126.)

J<sub>3</sub>.—2.3 kilometers N. of *Sioux Falls*, *Minnehaha Co.*, *S. Dak.*, 6 meters N. of the road on the S. line of sec. 5, T. 101, R. 49; 13 meters W. of the railway, at the southeast corner of a cultivated field; 0.4 meter below the rails. (Note 2, p. 126.)

City 1.—*Sioux Falls*, *Minnehaha Co.*, *S. Dak.*, on the SE. corner of the jail; a triangular shelf on the upper bevel of the sandstone cornerstone, at the extreme corner.

City 2.—*Sioux Falls*, *Minnehaha Co.*, *S. Dak.*, on the cross of the letter X in the word Sioux, cast in the sill of the NW. doorway of the Van Eps (1892) building.

City 3.—*Sioux Falls*, *Minnehaha Co.*, *S. Dak.*, the center of the first letter N in the word Union, cast in the sill of the NE. doorway of the Masonic Temple.

City 4.—*Sioux Falls, Minnehaha Co., S. Dak.*, a point on the iron sill of the NW. doorway of the Van Eps (1882) building, 0.75 meter S. of the N. end of the sill, and 0.05 meter E. of the front edge; unmarked.

U. S. G. S. Astronomic Station.—*Sioux Falls, Minnehaha Co., S. Dak.*, in the E. lawn of the Federal Building, on a brick pier, 18 by 18 by 36 inches, with a sandstone cap, lettered Astronomical Pier  $\times$  U. S. Geol. Survey; a point 25 millimeters NE. of the center of the cross.

I<sub>3</sub>.—*Sioux Falls, Minnehaha Co., S. Dak.*, in the eastern entrance of the Cataract Hotel; the center of the most southeasterly of the 3-inch round deadlights, 0.95 meter N. of the brick wall, 0.5 meter W. of the front edge of the top step, 1.2 meters above the sidewalk.

K<sub>3</sub>.—*Sioux Falls, Minnehaha Co., S. Dak.*, on the N. pier (granite) of the Chicago, St. Paul, Minneapolis and Omaha Ry. bridge over the Big Sioux River; 12 centimeters E. of the W. edge of the capstone, 9 centimeters S. of the N. edge; 1.2 meters below the rails, 4.3 meters above the water. (Note 5, p. 127.)

M<sub>3</sub>.—6.5 kilometers N. of *Harrisburg, Lincoln Co., S. Dak.*, 33 meters S. of the road on the N. line of sec. 13, T. 100, R. 50; 15 meters E. of the railway, 1 meter below the rail. (Note 34, p. 128.)

1484 YNKTN.—7.5 kilometers N. of *Harrisburg, Lincoln Co., S. Dak.*, NW. corner sec. 7, T. 100 N., R. 49 W. (Note 18, p. 127.)

1419 YNKTN.—0.8 kilometer E. of *Harrisburg, Lincoln Co., S. Dak.*, NW. corner sec. 6, T. 99 N., R. 49 W. (Note 18, p. 127.)

N<sub>3</sub>.—5 kilometers N. of *Harrisburg, Lincoln Co., S. Dak.*, 11 meters N. of the road on the S. line of sec. 13, T. 100, R. 50, 19 meters W. of the railway, 1 meter below the rails. (Note 34, p. 128.)

O<sub>3</sub>.—*Harrisburg, Lincoln Co., S. Dak.*, 30 meters E. of the railway, 8 meters N. of the road on the S. line of T. 100 N., on the S. line of a cultivated field, owned by Ole Sorensen, 15 meters E. of the corner, 0.2 meter above the rails. (Note 34, p. 128.)

P<sub>3</sub>.—1.6 kilometers S. of *Harrisburg, Lincoln Co., S. Dak.*, 11 meters S. of the road on the N. line of sec. 12, T. 99, R. 50, 16 meters W. of the railway, in the NE. corner of a pasture owned by W. W. Wasem. (Note 2, p. 126.)

Q<sub>3</sub>.—5 kilometers SE. of *Harrisburg, Lincoln Co., S. Dak.*, 17 meters NE. of the track, 12 meters W. of the road on the E. line of sec. 18, T. 99, R. 49; in the SE. corner of a pasture owned by F. P. Robinson, 0.6 meter below the rails. (Note 34, p. 128.)

R<sub>3</sub>.—4 kilometers N. of *Canton, Lincoln Co., S. Dak.*, 9 meters S. of the road on the N. line of sec. 11, T. 98, R. 49; 13 meters W. of the railway, 3 meters S. and 1 meter E. of adjacent fences; 0.6 meter below the rails. (Note 2, p. 126.)

S<sub>3</sub>.—*Canton, Lincoln Co., S. Dak.*, at the S. entrance to the county court-house, on the W. wall of the steps, at the W. edge of a red sandstone block, and 0.4 meter N. of the S. edge, 1 meter above ground, and 0.26 meter above the third step. (Note 13, p. 127.)

T<sub>3</sub>.—*Canton, Lincoln Co., S. Dak.*, on the jasper sill in the NW. doorway of the building occupied by the Bank of Lincoln County, 0.17 meter S. of the N. side of the archway, 0.26 meter E. of the front edge, 0.17 meter above the sidewalk. (Note 5, p. 127.)

A.—*Beloit, Lyon Co., Iowa*, 420 meters N. of the railway station, 13 meters W. of the track, 4 meters S. of a private road to the Orphans' Asylum; 1 meter E. and 2 meters S. of the NE. corner of a garden plot owned by J. Widdy, 1 meter below the rails. (Note 34, p. 128.)

B.—*Beloit, Lyon Co., Iowa*, 170 meters S. of the railway station, 31 meters E. of the track, 14 meters S. of the roadway, on a jasper rock, set in a garden plot, 2 meters S. and 1 meter E. of the NW. corner, 0.4 meter below the rails. (Note 5, p. 127.)

C.—3 kilometers S. of *Beloit, Lyon Co., Iowa*, 13 meters W. of the railway track, 4 meters N. of a private road, 110 meters N. of a trestle over a ravine, 1 meter E. of the fence, and 0.3 meter below the rails. (Note 34, p. 128.)

D.—5 kilometers NW. of *Elm Springs, Sioux Co., Iowa*, 13 meters W. of the railway, 8 meters N. of the road; on the S. line of sec. 5, T. 97, R. 48, 2 meters N. and 1 meter E. of the fences, 0.2 meter below the rails. (Note 2, p. 126.)

U<sub>3</sub>.—*Fairview, Lincoln Co., S. Dak.*, on the jasper foundations at the SE. corner of the most southeasterly grain elevator, 14 meters SW. of the SW. corner of the railway station, 8 centimeters above ground, 4 centimeters W. and N. of the corner of the stone. (Note 5, p. 127.)

V<sub>3</sub>.—0.8 kilometer S. of *Fairview, Lincoln Co., S. Dak.*, 14 meters E. of the railway, 4 meters N. of the road, 1.4 meters below the rails, and 1 meter W. of the fence. (Note 2, p. 126.)

W<sub>3</sub>.—1.5 kilometers S. of *Fairview, Lincoln Co., S. Dak.*, 12 meters W. of the main railway track and 33 meters E. of the siding, 3 meters N. of the road, 45 meters E. of the road along the track, at the level of the rails. (Note 34, p. 128.)

X<sub>3</sub>.—2.3 kilometers S. of *Fairview, Lincoln Co., S. Dak.*, 15 meters E. of the railway and 14 meters S. of the road; 1.5 meters below the rails, 1 meter E. and 8 meters S. of the NW. corner of a cultivated field. (Note 34, p. 128.)

E.—1.2 kilometers S. of *Austin, Sioux Co., Iowa*, and 1.6 kilometers S. of the railway bridge over the Big Sioux River; 13 meters W. of the railway, 6 meters N. of the road, 1 meter W. of the fence, and 0.8 meter below the rails. (Note 34, p. 128.)

Y<sub>3</sub>.—*Hudson, Lincoln Co., S. Dak.*, in the W. side of the entrance to Johnson & Torkelson's store, 1.3 meters W. of the center of the doorway, 0.3 meter above the sidewalk; 0.4 meter S. of the front edge of the sill; a square piece of yellow tiling, 75 millimeters on a side, set square with the pattern, the most northwesterly piece of that size and color in the pattern.

Z<sub>3</sub>.—*Hudson, Lincoln Co., S. Dak.*, 70 meters S. of the railway station, 17 meters W. of the track; on the SE. corner of the jasper foundations of the N. elevator; 7 centimeters N. and 2 centimeters W. of the edges of the stone, and 0.45 meter above ground. (Note 5, p. 127.)

A<sub>4</sub>.—1 kilometer S. of *Hudson, Lincoln Co., S. Dak.*, 14 meters E. of the railway, 11 meters W. of the road; 15 meters S. of the crossing, 1 meter W. of the fence, 2 meters S. of the corner of a pasture, and 0.4 meter below the rails. (Note 34, p. 128.)

B<sub>4</sub>.—5 kilometers S. of *Hudson, Lincoln Co., S. Dak.*, 15 meters W. of the railway, 234 meters N. of the crossroads, 200 meters N. of the schoolhouse; 11 meters E. of the road, 2 meters N. and 1 meter E. of the SW. corner of a pasture owned by M. Allen. (Note 2, p. 126.)

F.—5 kilometers N. of *Hawarden, Sioux Co., Iowa*, on the S. (sandstone) pier of the railway bridge over the Big Sioux River; 0.44 meter N. of the S. edge and 2 meters W. of the E. end of the capstone, 2 meters E. of the center of the track, and 1.7 meters below the rails. (Note 5, p. 127.)

G.—3 kilometers N. of *Hawarden, Sioux Co., Iowa*, 13 meters W. of the railway, 9 meters W. of the road, opposite the crossing; 3 meters S. and 1 meter E. of the NE. corner of a field owned by M. Austin. (Note 34, p. 128.)

H.—*Calliope, Sioux Co., Iowa*, 5.9 meters S. of the NE. corner of the McCaull-Webster elevator, 18 meters W. of the railway and 55 meters S. of the station; 0.4 meter above ground, 0.25 meter N. of the S. end of the foundation wall (pink jasper), at the E. edge. (Note 5, p. 127.)

I.—*Hawarden, Sioux Co., Iowa*, in a doorway of the Wood & Fleshman (1902) Block, 1.8 meters S. of the center and 2.2 meters E. of the front edge of the front step; a yellow circle in a blue square of tiling, 5 centimeters on each edge, the most southeasterly blue square in the design.

City.—*Hawarden, Sioux Co., Iowa*, on the N. side of Dakota street, 20 meters W. of the W. line of Kansas street, at the SW. corner of lot 14, block 5; on the S. sidewalk line; the center of the cap upon the upper end of a piece of heavily galvanized 3-inch iron pipe, 8 feet long, resting on a rock 6 feet underground.

J.—1 kilometer S. of *Hawarden, Sioux Co., Iowa*, 13 meters E. of the railway, 10 meters N. of the road; 1 meter W. and 2 meters N. of the SW. corner of a field owned by John Abbey, at the level of the rails. (Note 34, p. 128.)

K.—3 kilometers S. of *Hawarden, Sioux Co., Iowa*, 14 meters W. of the railway, 6 meters W. of the road, opposite the crossing; 1 meter E. of the W. road fence, at the level of the rails. (Note 2, p. 126.)

L.—4.5 kilometers S. of *Hawarden, Sioux Co., Iowa*, 500 meters N. of a railway cut, and 240 meters by rail S. of a section line; 13 meters NW. of the railway and 5 meters S. of the road; 0.4 meter below the rails; marked by a boulder. (Note 2, p. 126.)

M.—In *Sioux County*, 1.0 kilometer N. of *Chatsworth, Plymouth Co., Iowa*, 20 meters E. of the railway, 13 meters N. of the road, 2 meters E. and 1 meter N. of the SW. corner of a pasture, and 1.7 meters below the rails. (Note 34, p. 128.)

N.—*Chatsworth, Plymouth Co., Iowa*, 25 meters N. of the station, 29 meters E. of the railway, and 12 meters S. of the road; on a jasper rock set 1 meter S. and 0.5 meter W. of the NW. corner of a meadow. (Note 5, p. 127.)

O.—*Chatsworth, Plymouth Co., Iowa*, on the E. pier of the N. pair, under the railway water tank; 36 meters S. of the station, and 5.5 meters W. of the track; in the top bevel, 0.19 meter above ground, at the E. edge and 0.24 meter S. of the N. edge. (Note 5, p. 127.)

P.—2.3 kilometers S. of *Chatsworth, Plymouth Co., Iowa*, and 330 meters N. of a railway bridge; 3 meters N. of a road, 13 meters W. of the railway, 1 meter E. of the fence, and 0.5 meter below the rails. (Note 34, p. 128.)

Q.—1.4 kilometers N. of *Akron, Plymouth Co., Iowa*, and 13 meters S. of a railway bridge; 6 meter S. of the road, 15 meters W. of the railway, 0.5 meter E. of a pasture fence, 1.6 meter below the rails. (Note 34, p. 128.)

R.—*Akron, Plymouth Co., Iowa*, in the front doorsill (jasper) of the Akron Savings Bank, 0.47 meter NW. of the SE. side of the doorway, 0.12 meter SW. of the front edge, 0.45 meter above the sidewalks (Note 5, p. 127.)

City.—*Akron, Plymouth Co., Iowa*, at the NE. corner of Reed and Second streets, at the N. sidewalk line; 0.13 meter W. of the SW. corner of the building; the N. side of the top edge of a 1-inch galvanized iron pipe set solidly in cement flush with the sidewalk.

S.—1.5 kilometers S. of *Akron, Plymouth Co., Iowa*, 15 meters W. of the railway, and 40 meters W. of the road along the track; 6 meters N. of the road and 2 meters N. and 0.5 meter E. of the SE. corner of a cultivated field; 0.4 meter below the rails. (Note 3, p. 126.)

T.—4.0 kilometers S. of *Akron, Plymouth Co., Iowa*, 13 meters W. of the railway, 7 meters N. of the road, 1 meter E. of the fence, and 0.3 meter above the rails. (Note 2, p. 126.)

V.—*Westfield, Plymouth Co., Iowa*, 15 meters W. of the railway, 21 meters N. of the road; 6.55 meters S. of the NE. corner of the Hopkins elevator, 0.3 meter above ground, 0.1 meter N. of the S. edge of the jasper rock, at the E. edge. (Note 5, p. 127.)

U.—1.0 kilometer N. of *Westfield, Plymouth Co., Iowa*, 13 meters W. of the railway, 12 meters S. of the road, 1 meter W. of the fence, and 0.3 meter below the rails. (Note 34, p. 128.)

W.—1.6 kilometer S. of *Westfield, Plymouth Co., Iowa*, 14 meters E. of the railway, and 15 meters W. of the road along the track; 5 meters N. of the road, 1 meter S. and W. of fences, 0.6 meter below the rails. (Note 3, p. 126.)

X.—3.2 kilometers S. of *Westfield, Plymouth Co., Iowa*, 14 meters E. of the railway, and 12 meters W. of the road along the track; 6 meters N. of the road, 0.8 meter below the rails. (Note 2, p. 126.)

Y.—4.2 kilometers S. of *Westfield, Plymouth Co., Iowa*, and 1 017 meters E. of the bridge over the Big Sioux River; 4 meters E. of a private road, and 14 meters S. of the track; on a jasper rock, of quartzite, roughly squared for building purposes, about 1.0 by 0.5 by 3 meters, set 1 meter N. of the fence and 0.2 meter above the rails. (Note 5, p. 127.)

Z.—5.2 kilometers S. of *Westfield, Plymouth Co., Iowa*, at the E. end of the railway bridge over the Big Sioux River, on the NE. pier of the central four under the old railway water tank; on the extreme NW. corner of the stone, at the upper bevel, 0.4 meter above ground. (Note 5, p. 127.)

C<sub>4</sub>.—1.0 kilometer NE. of *Elk Point, Union Co., S. Dak.*, 1 041 meters by rail from the main line of railway at the junction; 13 meters NW. of the railway, 17 meters W. of the section line, 1 meter SE. of the fence, and 0.6 meter below the rails. (Note 34, p. 128.)

P. B. M. <sup>3</sup>/<sub>3</sub>.—*Elk Point, Union Co., S. Dak.*, in the SE. corner of the court-house yard. (Note 10, p. 127.)

D<sub>4</sub>.—1 kilometer S. of *Elk Point, Union Co., S. Dak.*, 105 meters W. of the railway, at the N. corner of the roads, 1 meter W. and 1 meter N. of the fences, 0.2 meter below the rails. (Note 34, p. 128.)

E<sub>4</sub>.—3.2 kilometers S. of *Elk Point, Union Co., S. Dak.*, 18 meters NE. of the railway, at the NE. corner of the crossroads, 1 meter N. and E. of the SW. corner of a cultivated field, 0.6 meter below the rails. (Note 2, p. 126.)

F<sub>4</sub>.—7.5 kilometers S. of *Elk Point, Union Co., S. Dak.*, 15 meters SW. of the railway, 8 meters N. of the road; 1 meter N. and W. of the SE. corner of a cultivated field, 0.4 meter below the rails. (Note 2, p. 126.)

G<sub>4</sub>.—*Jefferson, Union Co., S. Dak.*, 800 meters N. of the station; 15 meters SW. of the railway, 5 meters N. of the road, 1 meter W. and 0.5 meter S. of the SE. corner of a garden, 0.7 meter below the rails. (Note 34, p. 128.)

P. B. M. <sup>3</sup>/<sub>3</sub>.—*Jefferson, Union Co., S. Dak.*, in the NW. corner of the schoolhouse yard, at the NE. sidewalk line. (Note 10, p. 127.)

H<sub>4</sub>.—*Jefferson, Union Co., S. Dak.*, at the front entrance to the Fontaine Block; 0.45 meter NE. of the front edge of the sill, 0.75 meter SE. of the center of the doorway, 0.14 meter W. of the S. wood framing, 0.10 meter above the sidewalk; a blue triangle of tiling, 5 by 3.5 centimeters, the most southerly such piece in the design.

I<sub>4</sub>.—*Jefferson, Union Co., S. Dak.*, 400 meters S. of the station; 13 meters N. of the railway, 5 meters W. of the private road, 1 meter S. of the S. fence of a meadow, and 0.8 meter below the rails. (Note 34, p. 128.)

J<sub>4</sub>.—1.6 kilometers SE. of *Jefferson, Union Co., S. Dak.*, 13 meters SW. of the railway, 11 meters S. of the road, 1 meter SE. and 0.5 meter NE. of the NE. corner of a cultivated field, at the level of the rails. (Note 2, p. 126.)

K<sub>4</sub>.—3.6 kilometers SE. of *Jefferson, Union Co., S. Dak.*, 13 meters SW. of the railway, 12 meters E. of the road, 18 meters SE. of the crossing; 2 meters SE. and 0.5 meter NE. of the NW. corner of a cultivated field, at the level of the rails. (Note 2, p. 126.)

L<sub>4</sub>.—*McCook, Union Co., S. Dak.*, 450 meters N. of the station; 15 meters NE. of the railway, 11 meters E. of the road, opposite the crossing; 1 meter S. and 0.5 meter E. of the NW. corner of a cultivated field, 0.3 meter below the rails. (Note 34, p. 128.)

M<sub>4</sub>.—0.7 kilometer S. of *McCook, Union Co., S. Dak.*, 30 meters SW. of the railway, 12 meters SW. of the road along the track; 5 meters SE. of a private road, 1 meter NE. of the fence, 0.4 meter below the rails. (Note 34, p. 128.)

N<sub>4</sub>.—2.7 kilometers S. of *McCook, Union Co., S. Dak.*, on the W. bank of the Big Sioux River, 16 meters from the edge; 15 meters S. of the railway, in a wood lot, 1 meter S. of the fence, 1.2 meters below the rails. (Note 2, p. 126.)

P. B. M. 390.—*McCook, Union Co., S. Dak.*, 400 feet S. of the station, 130 feet SW. of the school-house, in the south road fence. (Note 10, p. 127.)

P. B. M. 399.—About 6 miles above *Sioux City, Iowa*, (See App. 8, Report for 1899, p. 842.) The B. M. is on Chicago, Milwaukee and St. Paul Ry. land, 14 meters W. of the track, 3 feet E. of the W. right-of-way fence, and 3 meters below the rails. In 1905 the cap had been stolen.

P. B. M. 398.—6 miles above *Sioux City, Woodbury Co., Iowa*. (See App. 8, Report for 1899, p. 841.) In 1905 the cap had been stolen.

P. B. M. 397.—3½ miles above *Sioux City, Woodbury Co., Iowa*. (See App. 8, Report for 1899, p. 841.) The B. M. is at the overhead crossing, 331 meters N. of the grade crossing at Brughier Bridge, 2 meters E. of the fence and at the level of the rails.

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN EVANSVILLE AND STEPHEN, MINN., 1905.

Q<sub>1</sub>.—Near *Brandon, Douglas Co., Minn.* (See p. 152.)

R<sub>1</sub>.—*Brandon, Douglas Co., Minn.* (See p. 152.)

S<sub>1</sub>.—*Evansville, Douglas Co., Minn.* (See p. 152.)

T<sub>1</sub>.—*Evansville, Douglas Co., Minn.* (See p. 152.)

M<sub>3</sub>.—About 2 miles NW. of *Evansville, Douglas Co., Minn.*, 5 telegraph poles W. of milepost 161, and 1 meter N. of the Great Northern Ry. right-of-way fence, on the side of a rocky hill. (Note 2, p. 126.)

N<sub>3</sub>.—*Melby, Douglas Co., Minn.*, about 100 meters W. of station platform, 35 meters W. of a road crossing; on the public highway, 8 meters S. of the Great Northern Ry. track. (Note 2, p. 126.)

O<sub>3</sub>.—About 1.6 miles NW. of *Melby, Douglas Co., Minn.*, on the Great Northern right of way, 4½ telegraph poles NW. of the road crossing; in the coping N. of the track of stone arch bridge 68, which is over a stream connecting Lake Christiana and Pelican Lake. (Note 16, p. 127.)

P<sub>3</sub>.—*Ashby, Grant Co., Minn.*, at the SW. corner of Melby street and the street one block south of Main street; in the NE. corner of the property owned by John Madland, 3 meters from the property line. (Note 3, p. 126)

Q<sub>3</sub>.—*Ashby, Grant Co., Minn.*, at the SE. corner of Main and Larsen streets; in the NW. corner and on the N. face of a yellow brick building owned by J. H. Bemis, 1 meter above the sidewalk. (Note 1, p. 126.)

R<sub>3</sub>.—1.5 miles NW. of *Ashby, Grant Co., Minn.*, 17 telegraph poles W. of milepost 169; ¾ meter NE. of the Great Northern Ry. right-of-way fence, on the property line of F. Caldwell's and L. O. Bratvold's farms. (Note 2, p. 126.)

S<sub>3</sub>.—*Dalton, Ottertail Co., Minn.*, about 475 meters N. of the Great Northern Ry. track; in the NW. corner of the public school grounds, ¾ meter from the property line. (Note 3, p. 126.)

Dalton Astronomic Station.—*Dalton, Ottertail Co., Minn.*, about 175 feet S. of the building occupied by the Bank of Dalton; on a prominent little knoll in the vacant lot owned by M. T. McMahon, who lives in Fergus Falls and is the owner of the Dalton Lumber Co. (Note 7, p. 127.)



T<sub>3</sub>.—*Dalton, Ottertail Co., Minn.*, on the Great Northern Ry. right of way, 50 meters E. and 50 meters N. of the Great Northern Ry. station; on property leased by the Minneapolis and Northern Elevator Co., 1 meter N. of the NW. corner of the engine house. (Note 2, p. 126.)

Dalton Triangulation Station.—1 mile W. of *Dalton, Ottertail Co., Minn.*, on the Great Northern Ry.; on a knoll in a pasture in the NE.  $\frac{1}{4}$ , SE.  $\frac{1}{4}$  sec. 10, T. 131 N., R. 42 W.; about 90 meters S. of the NE. corner of the quarter section of land owned by Ivir Vik, who lives about  $\frac{3}{8}$  mile W. of S. and across a small lake from the station; 2.42 meters W. of the fence at the eastern side of this section. (Note 7, p. 127.)

U<sub>3</sub>.—About 2.2 miles NW. of *Dalton, Ottertail Co., Minn.*,  $\frac{1}{2}$  mile W. of milepost 178, on the N. right of way; on the NE. corner of the coping of a stone arch bridge, 3 meters below the level of the rails. (Note 1, p. 126.)

V<sub>3</sub>.—*Parkdale, Ottertail Co., Minn.*, 15 $\frac{1}{2}$  telegraph poles W. of milepost 181; on the public road  $\frac{3}{4}$  meter S. of the right-of-way fence. (Note 3, p. 126.)

W<sub>3</sub>.—About 2.3 miles SE. of *Fergus Falls, Ottertail Co., Minn.*, on the right of way, 3 telegraph poles E. of milepost 184; on the S. coping of a stone arch culvert which is over a small stream flowing into the lake; in the center of the top surface. (Note 4, p. 127.)

X<sub>3</sub>.—*Fergus Falls, Ottertail Co., Minn.*, S. of tracks; on the SE. foundation of the Great Northern Ry. water tank, in the SE. corner of the stone. (Note 16, p. 127.)

Y<sub>3</sub>.—*Fergus Falls, Ottertail Co., Minn.*, at the SE. corner of Lincoln avenue and Mill street, on the doorstep of the northern entrance of the Pickett Block, in the middle of the building; 10 centimeters from the N. edge and 15 centimeters from the E. edge of the step. (Note 13, p. 127.)

City.—*Fergus Falls, Ottertail Co., Minn.*, at the SE. corner of Bismark avenue and Court street; the highest point of the check valve of a fire plug.

Z<sub>3</sub>.—*Fergus Falls, Ottertail Co., Minn.*, on the brick building of the Fergus Falls National Bank; on the Court street side, about 12 meters from Lincoln avenue; in the water table. (Note 1, p. 126.)

A<sub>4</sub>.—About 3.25 miles W. of *Fergus Falls, Ottertail Co., Minn.*, opposite the third telegraph pole W. of milepost 190; at the W. end of a cut and  $\frac{1}{2}$  meter inside of the northern right-of-way fence. (Note 2, p. 126.)

B<sub>4</sub>.—About 4 miles W. of *Fergus Falls, Ottertail Co., Minn.*, 6 telegraph poles E. of milepost 191; in the S. side of the W. abutment of a bridge over Ottertail River, in the SE. corner of the horizontal surface of the beveled capstone. (Note 4, p. 127.)

C<sub>4</sub>.—*Carlisle, Ottertail Co., Minn.*, 4 $\frac{1}{2}$  telegraph poles W. of the station; at a road crossing, in the NW. corner of the crossing and at the corner of the fence. (Note 2, p. 126.)

D<sub>4</sub>.—About 3 miles W. of *Carlisle, Ottertail Co., Minn.*, 2 $\frac{1}{2}$  telegraph poles W. of milepost 198; in the center of the N. coping of the stone arch cattle passage 84, about 5 centimeters from N. fence. (Note 15, p. 127.)

E<sub>4</sub>.—In *Ottertail Co., Minn.*, about 4 $\frac{1}{2}$  miles SE. of *Rothsay, Wilkin Co., Minn.*, on the eastern side of the public road, in the corner of the fence; on land of Pete Wilson, due W. of his house; about 500 meters SE. of Indian Triangulation Station, which is on a prominent bald knoll known as Indian Mound in the SE.  $\frac{1}{4}$  NE.  $\frac{1}{4}$ , sec. 4, T. 134, R. 44. (Note 2, p. 126.)

F<sub>4</sub>.—*Rothsay, Wilkin Co., Minn.*, about 100 meters S. of the railroad station, on the E. side of the track, in the SE. corner of the SE. foundation stone of the Great Northern Ry. water tank. (Note 13, p. 127.)

G<sub>4</sub>.—*Rothsay, Wilkin Co., Minn.*, at the NW. corner of Second and Main streets; in the door sill of the S. entrance of the yellow brick building owned by the Independent Order of Odd Fellows lodge and used as a bank; at the W. end of the sill. (Note 16, p. 127.)

H<sub>4</sub>.—*Rothsay, Wilkin Co., Minn.*, about 200 meters E. of the Great Northern Ry. tracks; on the public school building, erected in 1903; in the concrete water table at the S. side of the entrance, about 0.2 meter above the ground. (Note 1, p. 126.)

I<sub>4</sub>.—About 3 miles NW. of *Rothsay, Wilkin Co., Minn.*, 7 telegraph poles S. of milepost 207; at the public road crossing and in the NE. corner formed by intersection of the public highway and the Great Northern Ry. right of way; on property owned by John Nymoen. (Note 2, p. 126.)

J<sub>4</sub>.—*Lawndale, Wilkin Co., Minn.*, 25 meters N. of the signboard; 50 meters E. of the main track of the Great Northern Ry., on the eastern side of the public road as mapped out, but on the W. side of the road now in use; about 1 $\frac{1}{2}$  meters from the telephone pole where the line changes direction. (Note 3, p. 126.)

K<sub>4</sub>.—About  $1\frac{1}{2}$  miles N. of *Lawndale, Wilkin Co., Minn.*, at the road crossing, 5 telegraph poles S. of milepost 212; on the right of way 11 meters W. of the track. (Note 2, p. 126.)

L<sub>4</sub>.—About 2 miles S. of *Barnesville, Clay Co., Minn.*, 7 meters N. of the second telegraph pole S. of milepost 215, and 10 meters W. of the center of the tracks; in the center of the top surface of a large granite boulder on the right of way, almost level with the ground. (Note 5, p. 127.)

M<sub>4</sub>.—About  $\frac{1}{8}$  mile S. of the railway station at *Barnesville, Clay Co., Minn.*, at a crossing; about 50 meters E. of the Great Northern Ry. tracks, at the corner of the public road, on the E. side, in a corner of the fence. (Note 3, p. 126.)

N<sub>4</sub>.—*Barnesville, Clay Co., Minn.*, at the W. entrance of the public school building, on Madison avenue, at the N. end of the horizontal surface of the top step. (Note 16, p. 127.)

O<sub>4</sub>.—*Barnesville, Clay Co., Minn.*, on the W. side of Front street, between Second and Third streets, 1 meter N. of the central entrance to a large red brick building, known as the Oliver Block; in the sandstone sill. (Note 1, p. 126.)

P<sub>4</sub>.—About 2 miles N. of *Barnesville, Clay Co., Minn.*, 1 mile N. of the junction; 2 telegraph poles N. of milepost 3, opposite wooden culvert 3; on the right of way, in range with the telegraph poles. (Note 2, p. 126.)

Q<sub>4</sub>.—About  $4\frac{1}{2}$  miles NW. of *Barnesville, Clay Co., Minn.*, 5 telegraph poles E. of milepost 4 on the line running to Fargo, N. Dak., in range with the telephone poles on the N. side of the track. (Note 2, p. 126.)

R<sub>4</sub>.—*Downer, Clay Co., Minn.*, 175 meters S. of the depot, on an elevator of the Hennepin Elevator Co.; on the horizontal surface of the foundation, on the N. side, 2 meters E. of the NW. corner of the building. (Note 36, p. 128.)

S<sub>4</sub>.—*Downer, Clay Co., Minn.*, 175 meters N. of the depot, at the NW. corner of a grade crossing on the right of way, 8 meters N. of a telegraph pole and in range with the telegraph poles. (Note 35, p. 128.)

T<sub>4</sub>.—About  $1\frac{1}{2}$  miles N. of *Downer, Clay Co., Minn.*, 14 telegraph poles N. of milepost 10; at the NE. corner of a grade crossing, in a corner of a pasture fence; in soft clay. (Note 2, p. 126.)

U<sub>4</sub>.—About 1 mile N. of *Crawford, Clay Co., Minn.*, 16 telegraph poles S. of milepost 15; at the NW. corner of a grade crossing, on the right of way, 2 meters N. of a telegraph pole and in range with the poles. (Note 2, p. 126.)

V<sub>4</sub>.—About 1 mile S. of *Glyndon, Clay Co., Minn.*, 11 telegraph poles S. of milepost 18; at the SW. corner of a grade crossing; on the right of way, 4 meters S. of a telegraph pole and in range with the poles. (Note 35, p. 128.)

W<sub>4</sub>.—*Glyndon, Clay Co., Minn.*, on the Northern Pacific right of way, 11 telegraph poles W. of the railroad crossing; on the W. abutment of a steel girder bridge; on the N. side, in the center of the beveled concrete surface. (Note 36, p. 128.)

X<sub>4</sub>.— $1\frac{1}{2}$  miles S. of *Averill, Clay Co., Minn.*, on the Great Northern Ry. right of way, 16 telegraph poles S. of milepost 24, opposite whistling post marked  $\frac{W}{X}$ ; in range with telegraph poles, set in soft clay. (Note 2, p. 126.)

Y<sub>4</sub>.—*Averill, Clay Co., Minn.*, 6 rails N. of the N. switch, 3 meters N. of the first telegraph pole N. of the grade crossing; 13 meters W. of the Great Northern Ry. track, in range with telegraph poles. (Note 35, p. 128.)

Z<sub>4</sub>.—About 3 miles S. of *Felton, Clay Co., Minn.*, 3 meters N. of milepost 30; on the right of way in range with the telegraph poles. (Note 35, p. 128.)

A<sub>5</sub>.—*Felton, Clay Co., Minn.*, 2 telegraph poles S. of milepost 33; 35 meters W. of the station, 5 meters S. of S. line of station; in corner of a fence on the property of J. J. Hynes. (Note 35, p. 128.)

B<sub>5</sub>.—*Felton, Clay Co., Minn.*, 1 telegraph pole N. of milepost 33; at the SW. corner of the elevator owned by Jenkins Elevator Co.; in the horizontal surface of the foundation stone, 3 inches from the S. edge and 4 inches from the W. edge. (Note 4, p. 127.)

C<sub>5</sub>.—In *Clay Co., Minn.*, 3 miles S. of *Borup, Norman Co., Minn.*, 3 telegraph poles N. of milepost 37; in a corner of the fence at the NE. corner of the grade crossing and 25 meters E. of the center of the track on land belonging to A. E. Fox; set in clay. (Note 2, p. 126.)

D<sub>5</sub>.—*Borup, Norman Co., Minn.*,  $2\frac{1}{2}$  telegraph poles N. of the station, 20 meters E. of the tracks; on the W. wall of the yellow brick engine house of the Cargill Elevator Co.; in the center of the wall, 6 courses of brick below the window sill, set in cement. (Note 4, p. 127.)

E<sub>5</sub>.—*Borup, Norman Co., Minn.*, about 400 meters E. of the Great Northern Ry. tracks, in the NE. corner of the public school grounds; 7 meters from the eastern edge of the property and 3 meters from the N. edge; about 420 meters S. of Borup Triangulation Station. (Note 12, p. 127.)

F<sub>5</sub>.—*Wheatville, Norman Co., Minn.*, 2½ telegraph poles N. of milepost 43; at the SE. corner of a grade crossing, and in a corner of the fence, on land owned by Bore Hoven. (Note 12, p. 127.)

G<sub>5</sub>.—*Ada, Norman Co., Minn.*, at the NE. corner of the county court-house; on the N. side of the building, 1 foot above the ground. (Note 1, p. 126.)

Geological Survey Meridian Mark.—*Ada, Norman Co., Minn.*, at the NE. corner of Park and Garfield avenues; about 15 meters E. of the corner, in the parking; on the southernmost of the two meridian marks, a stone post about 5 inches square and having a metallic disk set in the top face, marked "U. S. Geological Survey Meridian Mark." The center of the disk is the bench mark.

H<sub>5</sub>.—*Ada, Norman Co., Minn.*, at the NE. corner of Washington and Atlantic avenues; in a red brick building, called the Keller, Sprague and Lofgren Block; in the horizontal surface of the first step, 6 inches from the N. edge. (Note 14, p. 127.)

I<sub>5</sub>.—*Ada, Norman Co., Minn.*, on the eastern side of Pacific avenue, 60 meters N. of Shields avenue; on the city water tanks; on the NE. corner of the steel foot of the NE. support to the tank; 2 feet above ground, on the horizontal surface of the steel plate; a square cut in outline.

J<sub>5</sub>.—*Hadler, Norman Co., Minn.*, 4 telegraph poles S. of the signboard, 3 meters S. of milepost 53; in range with the telegraph poles, 12 meters W. of the track. (Note 12, p. 127.)

K<sub>5</sub>.—1.2 miles E. and ½ mile N. of *Hadler, Norman Co., Minn.*, in Pleasant View Township, near the NE. corner of the SW.¼ of sec. 15; in the corner of a pasture fence about 5 meters S. of the quarter section road, and about 500 meters SW. of Wicklow Triangulation Station; set in sandy clay. (Note 2, p. 126.)

L<sub>5</sub>.—*Lockhart, Norman Co., Minn.*, 3 telegraph poles N. of milepost 58; at the SE. corner of the grade crossing, 50 meters E. of the main Great Northern Ry. track; in a corner of a fence, on the Lockhart farm. (Note 2, p. 126.)

M<sub>5</sub>.—*Beltrami, Polk Co., Minn.*, 50 meters N. of the station, on the W. side of the track, at the SW. corner of the railroad water tank; in the SW. corner of the horizontal surface of stone. (Note 16, p. 127.)

N<sub>5</sub>.—*Beltrami, Polk Co., Minn.*, about 200 meters N. of station; on the building of the Imperial Elevator Co., in the rough granite foundation stone of the elevator; on the N. side, 1 meter from the W. side and 0.3 meter above ground, in the vertical surface. (Note 4, p. 127.)

O<sub>5</sub>.—1 mile N. of *Beltrami, Polk Co., Minn.*, 4 telegraph poles N. of milepost 66, 20 meters S. of the grade crossing; on the right of way E. of the tracks, 2 meters N. of a telegraph pole, and in range with the telegraph poles. (Note 2, p. 126.)

P<sub>5</sub>.—*Russia, Polk Co., Minn.*, 30 meters N. of the signboard, 55 meters E. of the Great Northern Ry. track; at the NW. corner of the road crossing, on Russia farm. (Note 12, p. 127.)

Q<sub>5</sub>.—1 mile N. of *Russia, Polk Co., Minn.*, 7 telegraph poles N. of milepost 72; 30 meters east of the track, on the right of way, in a fence corner. (Note 2, p. 126.)

R<sub>5</sub>.—*Kittson, Polk Co., Minn.*, 110 meters N. of the signboard, on the right of way W. of the track, in range with the telegraph poles. (Note 12, p. 127.)

S<sub>5</sub>.—1¼ miles N. of *Kittson, Polk Co., Minn.*, 8 telegraph poles S. of milepost 77; at the NW. corner of the grade crossing, in a corner of the fence. (Note 2, p. 126.)

T<sub>5</sub>.—2¼ miles N. of *Kittson, Polk Co., Minn.*, about 200 meters W. of Andover Triangulation Station, at the NW. corner of a grade crossing and 5 meters N. of the highway limit. (Note 2, p. 126.)

U<sub>5</sub>.—*Crookston, Polk Co., Minn.*, on the E. side of the S. abutment of the steel railway bridge over Red Lake River; in the NE. corner of the horizontal surface of the coping stone. (Note 36, p. 128.)

V<sub>5</sub>.—*Crookston, Polk Co., Minn.*, at the side entrance of the store at the NW. corner of Main and Roberts streets, 35 meters W. of the E. line of building; at the W. end of the horizontal surface of the top step. (Note 16, p. 127.)

City.—*Crookston, Polk Co., Minn.*, at the entrance to the Merchants' National Bank building, on the NW. corner of Second and Main streets; a square in outline, on the N. side of the top of the first step.

W<sub>5</sub>.—*Crookston, Polk Co., Minn.*, at the NE. corner of the county court-house; on the N. side, 2 feet from the E. side, 3 feet above ground, in the second course of stone. (Note 1, p. 126.)

X<sub>5</sub>.—About 3 miles N. of *Crookston, Polk Co., Minn.*, on the Great Northern Ry. right of way, 65 meters S. of the Northern Pacific R. R. crossing; on W. side of the Great Northern Ry. tracks, in range with the telegraph poles; set in clay. (Note 2, p. 126.)

Y<sub>5</sub>.—*Shirley, Polk Co., Minn.*, 120 meters S. of signboard, in range with the telegraph poles and in the right of way; set in clay. (Note 12, p. 127.)

Z<sub>5</sub>.—1 mile N. of *Shirley, Polk Co., Minn.*, on the Great Northern Ry. right of way, directly opposite signboard "Shirley 1 mile"; 13 telegraph poles N. of milepost 6, 12 meters S. of the telegraph pole with the section numbers, 52, 53; on the right of way, in range with the telegraph poles; set in clay. (Note 2, p. 126.)

A<sub>6</sub>.—About  $\frac{1}{2}$  mile S. of *Euclid, Polk Co., Minn.*,  $5\frac{1}{2}$  telegraph poles N. of mile post 12; on the eastern side of the track, at the SE. corner of the surveyed highway crossing, in range with telephone poles. (Note 12, p. 127.)

B<sub>6</sub>.—*Euclid, Polk Co., Minn.*, 200 meters W. of the Great Northern Ry. depot, in the SE. corner of the public school grounds; 5 feet from the S. property line, and 1 foot from the E. property line; set in clay. (Note 2, p. 126.)

C<sub>6</sub>.—About 2 miles N. of *Euclid, Polk Co., Minn.*, 10 telegraph poles S. of milepost 15; 17 paces W. of the Great Northern Ry. track, in the NE. corner of the cemetery fence; set in clay. (Note 2, p. 126.)

D<sub>6</sub>.—Near *Angus, Polk Co., Minn.*, about 200 meters SW. of Sherack Triangulation Station, in the NE. corner of NE.  $\frac{1}{4}$  of sec. 1, Keystone township; 25 paces W. of a road crossing; 1 foot S. of a pasture fence; set in cement. (Note 2, p. 126.)

E<sub>6</sub>.—*Angus, Polk Co., Minn.*, 400 meters S. of the depot, 200 meters W. of the track; in the SE. corner of the public school grounds; set in clay. (Note 12, p. 127.)

F<sub>6</sub>.—About  $2\frac{1}{2}$  miles N. of *Angus, Polk Co., Minn.*, 5 meters S. of milepost 23; in the right of way, and in range with the telegraph poles; set in clay. (Note 2, p. 126.)

G<sub>6</sub>.—*Warren, Marshall Co., Minn.*,  $\frac{1}{4}$  mile S. of the station,  $3\frac{1}{2}$  telegraph poles S. of milepost 29; on the E. side of the tracks, in a corner of the right-of-way fence, set in clay. (Note 12, p. 127.)

H<sub>6</sub>.—*Warren, Marshall Co., Minn.*, 300 meters SE. of the depot, at the W. entrance of the county court-house; at the N. end of the horizontal surface of the second step. (Note 16, p. 127.)

I<sub>6</sub>.—*Warren, Marshall Co., Minn.*, at the S. entrance to Warren State Bank, on the NW. corner of Johnson avenue and Main street; at the W. end of the horizontal surface of the stone step. (Note 1, p. 126.)

J<sub>6</sub>.—*Warren, Marshall Co., Minn.*, 400 meters N. of the depot; on the city water tank, at the NE. corner of the structure, on the NE. corner of the steel foot; a square cut in outline, 1 foot above ground.

K<sub>6</sub>.— $2\frac{1}{2}$  miles N. of *Warren, Marshall Co., Minn.*,  $7\frac{1}{2}$  telegraph poles S. of milepost 32; on the right of way W. of the track, in a corner of the right-of-way and cattle-guard fences; set in cement. (Note 2, p. 126.)

L<sub>6</sub>.—About 2 miles S. of *Argyle, Marshall Co., Minn.*,  $10\frac{1}{2}$  telegraph poles N. of milepost 37; at the NW. corner of a grade crossing, in a corner of the right-of-way and cattle guard fences; set in clay. (Note 2, p. 126.)

M<sub>6</sub>.—*Argyle, Marshall Co., Minn.*, 500 meters W. of the depot, in the NW. corner of the public school grounds; set in clay. (Note 12, p. 127.)

N<sub>6</sub>.—*Argyle, Marshall Co., Minn.*, at the E. entrance of the yellow brick building occupied by the Farmers and Merchants' Bank, on the SW. corner of Third street and Pacific avenue; on the N. end of the horizontal surface of the third stone step; a square cut in outline, lettered U. S.

O<sub>6</sub>.—Near *Argyle, Marshall Co., Minn.*, in *Tamarac Township*, in sec. 35, T. 157, R. 48, about 420 meters N. of Argyle Triangulation Station; on the W. side of the road leading to a farmhouse, in a corner of the fence; on property of Mr. Josc; set in clay. (Note 2, p. 126.)

P<sub>6</sub>.—1 mile S. of *Stephen, Marshall Co., Minn.*, 3 telegraph poles N. of milepost 46; on the right of way, at the NW. corner of the grade crossing, 2 meters N. of a telegraph pole and in range with the poles; set in clay. (Note 2, p. 126.)

Q<sub>6</sub>.—*Stephen, Marshall Co., Minn.*, at the E. entrance to the red brick building owned by the Bank of Stephen, on the NW. corner of Pacific avenue and Fifth street; at the N. end of the top of the second step. (Note 1, p. 126.)

R<sub>6</sub>.—*Stephen, Marshall Co., Minn.*, 600 meters W. of the depot; on the E. side of the public school building, 2 feet from the S. side, in the eighth course of brick above the water table. (Note 4, p. 127.)

S<sub>6</sub>.—*Stephen, Marshall Co., Minn.*, 225 meters E. of the depot; at the NE. corner of the road crossing, in a corner of the fence; set in clay. (Note 12, p. 127.)

T<sub>6</sub>.—Near *Stephen, Marshall Co., Minn.*, in the NW. corner of the NE.  $\frac{1}{4}$  sec. 4, T. 157, R. 48; 37 meters SW. of the Stephen West Base, 11 meters S. of the road and 5 meters E. of the drainage ditch; set in clay. (Note 2, p. 126.)

Stephen West Base.—About  $\frac{1}{2}$  mile N. and  $\frac{3}{4}$  mile E. of *Stephen, Marshall Co., Minn.*, in *Sinnot Township*, in the SW. corner of the SE.  $\frac{1}{4}$  sec. 33, T. 158, R. 48, on cultivated land belonging to Mr. J. Gillespie of Stephen; 31.0 meters E. of half section line and 15.0 meters N. of the center of the E. and W. section road; an outlined square cut on the top of a granite block, about 3 inches to the southward of the copper bolt marking the station.

DESCRIPTIONS OF PERMANENT BENCH MARKS FROM SMITHVILLE TO GALVESTON, TEX., 1906-1906.

W<sub>5</sub>.—*Smithville, Bastrop Co., Tex.* (See App. 7, Report for 1904, p. 446.)

X<sub>5</sub>.—*Smithville, Bastrop Co., Tex.* (See App. 7, Report for 1904, p. 446.)

Y<sub>5</sub>.—*Smithville, Bastrop Co., Tex.* (See App. 7, Report for 1904, p. 446.)

316 Primms Spur.—*Kirtley, Fayette Co., Tex.*; an iron post set near the right-of-way fence and back of the second telegraph pole E. of mile board 974; marked 316. (Note 18, p. 127.)

U<sub>6</sub>.—2 miles SE. of *Kirtley, Fayette Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry., near mile board 976; on the E. concrete abutment of bridge 2064, in the top surface, 1 meter from the N. edge. (Note 36, p. 128.)

292 West Point.—*West Point, Fayette Co., Tex.*, 90 feet W. and 40 feet N. of the junction, at the crossing of the San Antonio and Aransas Pass Ry. and Missouri, Kansas and Texas Ry.; in a corner of the right-of-way fence; an iron post, marked 295. (Note 18, p. 127.)

V<sub>6</sub>.—*West Point, Fayette Co., Tex.*, 60 meters E. of the Missouri, Kansas and Texas Ry. station; in the NE. corner of a grade crossing,  $\frac{1}{2}$  meter from the right-of-way fence; on land owned by J. L. House. (Note 11, p. 127.)

W<sub>6</sub>.—*Plum, Fayette Co., Tex.*, 4 telegraph poles W. of the station, in the NW. corner of a grade crossing;  $\frac{1}{2}$  meter from the right-of-way fence, on the land owned by J. C. Brown of La Grange; set in clay. (Note 2, p. 126.)

X<sub>6</sub>.—*Plum, Fayette Co., Tex.*, 175 meters SE. of the station and 45 meters SW. of the Missouri, Kansas and Texas Ry. tracks, in the corner of a fence, about 15 meters NW. of the store and on the land owned by Anton Legler. (Note 11, p. 127.)

Y<sub>6</sub>.—2 miles NW. of *La Grange, Fayette Co., Tex.*, 14 telegraph poles W. of mile board 987; 70 meters W. of a grade crossing and  $\frac{1}{2}$  meter N. of the right of way of the Missouri, Kansas and Texas Ry.; in the corner of a fence, on land owned by Christian Diers; set in clay. (Note 2, p. 126.)

Z<sub>6</sub>.—*La Grange, Fayette Co., Tex.*, in the county court-house; on the stone step of the Washington Street entrance, in the horizontal surface of the first step from the top,  $\frac{2}{3}$  foot from the S. end. (Note 16, p. 127.)

A<sub>7</sub>.—*La Grange, Fayette Co., Tex.*, on Colorado street, in the NE. corner of the First National Bank building; in the vertical surface of the water table, 0.2 meter from the E. face. (Note 1, p. 126.)

B<sub>7</sub>.—*La Grange, Fayette Co., Tex.*, 275 meters NE. of the Missouri, Kansas and Texas Ry. station and  $\frac{1}{2}$  meter NW. of the right of way; in the NE. corner of a grade street crossing; on the property of John Speckels. (Note 11, p. 127.)

C<sub>7</sub>.— $1\frac{1}{4}$  miles W. of *Halsted, Fayette Co., Tex.*, 30 meters W. of mile board 993;  $\frac{2}{3}$  meter S. of the right of way of the Missouri, Kansas and Texas Ry., in the SE. corner of a private grade crossing; on land owned by Ernest Nitschke; set in clay. (Note 2, p. 126.)

D<sub>7</sub>.—450 meters W. of *Halsted, Fayette Co., Tex.*, on the right of way,  $2\frac{2}{3}$  meter from the S. fence, in the SE. corner of a grade crossing. (Note 11, p. 127.)

E<sub>7</sub>.—*Fayetteville, Fayette Co., Tex.*, in the brick store owned by H. Zapp's Sons; in the concrete water table on the S. side of the E. entrance. (Note 1, p. 126.)

F<sub>7</sub>.—*Fayetteville, Fayette Co., Tex.*, 18 meters E. of the station; on the right of way 6 meters N. of the tracks, in range with a row of trees in the parking. (Note 11, p. 127.)

G<sub>7</sub>.—*Boggy Tank, Fayette Co., Tex.*, 9 telegraph poles W. of mile board 1006; near the S. end of the W. abutment of bridge 2104, in the horizontal surface, 0.2 meter from the S. edge of the capstone. (Note 4, p. 127.)

11.— $3\frac{1}{2}$  miles W. of *New Ulm, Austin Co., Tex.*, 6 meters E. of mile board 1010; in the corner of the right-of-way and cattle-guard fences. (Note 11, p. 127.)

17.—*New Ulm, Austin Co., Tex.*, 100 meters NE. of the Missouri, Kansas and Texas Ry. station; in the brick store owned by L. R. Fink, on the E. side of the building, 1 meter from the N. side,  $1\frac{1}{2}$  meters above ground. (Note 4, p. 127.)

J7.—*New Ulm, Austin Co., Tex.*, 225 meters W. of mile board 1014; on the N. right of way, in the corner of the right-of-way and cattle-guard fences. (Note 11, p. 127.)

K7.— $4\frac{1}{2}$  miles E. of *New Ulm, Austin Co., Tex.*, 9 telegraph poles E. of mile board 1018, on the right of way of the Missouri, Kansas and Texas Ry., 11 paces N. of the tracks, set in sand. (Note 2, p. 126.)

L7.—*Cat Spring, Austin Co., Tex.*, 125 meters W. of mile board 1024;  $\frac{1}{8}$  meter S. of the right of way, at the SW. corner of a grade crossing. (Note 11, p. 127.)

M7.—6 miles W. of *Sealy, Austin Co., Tex.*, 10 telegraph poles E. of mile board 1029; on the right of way of the Missouri, Kansas and Texas Ry., in the NE. corner of a grade crossing,  $\frac{1}{8}$  meter from the right-of-way fence. (Note 2, p. 126.)

N7.— $3\frac{3}{4}$  miles W. of *Sealy, Austin Co., Tex.*, 13 telegraph poles E. of mile board 1031; in the NE. corner of a grade crossing, 0.2 meter N. of the right of way of the Missouri, Kansas and Texas Ry. (Note 11, p. 127.)

O7.—*Sealy, Austin Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry., 35 meters E. of the station; on the water tank on the top of the second concrete mudsill from the tracks, 0.1 meter from the W. end of the sill. (Note 16, p. 127.)

P7.—*Sealy, Austin Co., Tex.*, on Foulken street, in the center of the E. face of the brick store owned by A. Preibisch, about 1.3 meters above the walk. (Note 4, p. 127.)

Q7.—*Sealy, Austin Co., Tex.*, on Foulken street, in the cement walk in front of the brick store owned by Mistroit Bros. & Co., 0.15 meter from the NW. corner of the building. (Note 13, p. 127.)

R7.— $1\frac{1}{2}$  miles E. of *San Felipe, Austin Co., Tex.*,  $4\frac{1}{2}$  telegraph poles W. of mile board 1040; in the NW. corner of a grade crossing,  $\frac{1}{2}$  meter from the right of way of the Missouri, Kansas and Texas Ry., on land owned by John Hluchan; set in clay. (Note 2, p. 126.)

S7.— $\frac{1}{2}$  mile E. of *McDowell, Austin Co., Tex.*, on the Missouri, Kansas and Texas Ry.; on bridge 2156 over the Brazos River, at the S. end of the first pier W. of the Austin-Waller county line; on the top surface of the southernmost short section of rail, resting on the cement pier; a 2.5 centimetersquare, chiseled in outline between two transverse girders.

T7.—3 miles W. of *Brookshire, Waller Co., Tex.*, 5 telegraph poles W. of mile board 1045; on the right of way of the Missouri, Kansas and Texas Ry., in the NE. corner of a grade crossing,  $\frac{3}{8}$  meter from the right-of-way fence; set in clay. (Note 2, p. 126.)

U7.—*Brookshire, Waller Co., Tex.*, 300 meters W. of the station; on the right of way of the Missouri, Kansas and Texas Ry., in the SW. corner of a grade crossing,  $\frac{1}{8}$  meter from the right-of-way fence. (Note 11, p. 127.)

V7.—3 miles E. of *Brookshire, Waller Co., Tex.*, 4 rails W. of mile board 1051; on the right of way of the Missouri, Kansas and Texas Ry., in the NW. corner of a grade crossing,  $\frac{1}{8}$  meter from the right-of-way fence; set in clay. (Note 2, p. 126.)

W7.—In *Waller Co.*,  $1\frac{1}{4}$  miles W. of *Katy, Harris Co., Tex.*,  $12\frac{1}{8}$  telegraph poles E. of mile board 1054; on the right of way of the Missouri, Kansas and Texas Ry., in the NW. corner of a grade crossing, 15 paces N. of the tracks. (Note 11, p. 127.)

X7.—*Katy, Harris Co., Tex.*, 175 meters W. and 100 meters S. of the Missouri, Kansas and Texas Ry. station; in the water tank owned by the Katy Rice Milling Co., in the horizontal surface of the SW. foundation. (Note 4, p. 127.)

Y7.—*Katy, Harris Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry., 65 meters E. of the station, on the water tank; at the E. end of the fourth concrete mudsill from the tracks, in the vertical surface. (Note 1, p. 126.)

Z7.— $2\frac{3}{4}$  miles E. of *Katy, Harris Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry., 15 telegraph poles E. of mile board 1058, in the SE. corner of a grade crossing, 15 meters S. of the tracks. (Note 11, p. 127.)

A8.—*Burnip, Harris Co., Tex.*, 20 meters W. of the signboard; 35 meters S. of the Missouri, Kansas and Texas Ry. tracks, on the S. side of a public highway,  $\frac{1}{8}$  meter from the property line. (Note 11, p. 127.)

B<sub>8</sub>.—*Barker, Harris Co., Tex.*, 20 meters W. of the signboard; 35 meters S. of the Missouri, Kansas and Texas Ry. tracks, in the corner of a fence, on land owned by G. T. Miller; set in cement. (Note 2, p. 126.)

C<sub>8</sub>.—*Letitz, Harris Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry.; 65 meters E. of the station and 30 meters S. of the tracks, in the corner of a fence; set in clay. (Note 2, p. 126.)

D<sub>8</sub>.—2½ miles W. of *Hillendahl, Harris Co., Tex.*, 8½ telegraph poles W. of mile board 1071; in the SE. corner of a grade crossing, 15 meters S. of the Missouri, Kansas and Texas Ry. tracks; set in clay. (Note 2, p. 126.)

E<sub>8</sub>.—¾ mile W. of *Hillendahl, Harris Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry., 11 telegraph poles W. of mile board 1073; on a concrete culvert, in the center of the horizontal surface, 0.15 meter from the N. edge. (Note 36, p. 128.)

F<sub>8</sub>.—1 mile E. of *Hillendahl, Harris Co., Tex.*, 7½ telegraph poles E. of mile board 1074; at the NE. corner of a grade crossing, on the public highway, 15 meters N. of the Missouri, Kansas and Texas Ry. tracks, on range with the right-of-way fence; set in clay. (Note 2, p. 126.)

G<sub>8</sub>.—3 miles E. of *Hillendahl, Harris Co., Tex.*, 10½ telegraph poles E. of mile board 1076; 35 meters S. of the Missouri, Kansas and Texas Ry. tracks, in the SE. corner of a highway junction; on land owned by Gustav Peachman. (Note 11, p. 127, except the post was 5 by 8 inches.)

H<sub>8</sub>.—*Eureka, Harris Co., Tex.*, on the right of way of the Missouri, Kansas and Texas Ry., 150 meters E. of the Houston and Texas Central R. R. crossing; in the concrete foundation of a block signal. (Note 16, p. 127.)

I<sub>8</sub>.—*Houston Heights, Harris Co., Tex.*, 7½ telegraph poles E. of mile board 1081, and 25 meters S. of the Missouri, Kansas and Texas Ry. tracks; in the parking and midway between two electric car lines; set in clay. (Note 2, p. 126.)

J<sub>8</sub>.—*Houston, Harris Co., Tex.*, at the NE. corner of Willow and Baker streets, in the center of the W. face of the supporting pillar at the SW. corner of the building of the Peden Iron and Steel Co.; in the concrete water table, about 1 meter above the cement walk. (Note 1, p. 126.)

K<sub>8</sub>.—*Houston, Harris Co., Tex.*, at the SE. corner of Franklin and Fannin streets, in the stone step of the N. entrance to the post-office; on the horizontal surface, 0.1 meter from the E. end of the lower step. (Note 13, p. 127.)

L<sub>8</sub>.—*Houston, Harris Co., Tex.*, on Gable street, 90 meters N. of the Galveston, Houston and Henderson R. R. tracks; on the S. abutment of the steel highway bridge over Buffalo Bayou; in the horizontal surface, 25 centimeters from W. edge. (Note 1, p. 126.)

City.—*Houston, Harris Co., Tex.*, at the SE. corner of Milby street and Harrisburg road, 10 inches N. of a telegraph pole; a bolt driven into the ground, the top level with the curb.

M<sub>8</sub>.—3 miles E. of *Houston, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R., 8½ telegraph poles E. of mile board 3, and 3 meters N. of the track; in the center of the top surface of a concrete culvert. (Note 15, p. 127.)

N<sub>8</sub>.—¾ mile N. of *Harrisburg, Harris Co., Tex.*, on right of way of the Galveston, Houston and Henderson R. R., 5½ telegraph poles S. of mile board 5; 8 meters E. of the tracks, and about 2 meters below the level of the rail; in the center of the top surface of a concrete culvert. (Note 4, p. 127, the bolt being set in lead and lettered U. S. B. M.)

R. M.—*Harrisburg, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 25 meters S. of the Galveston, Harrisburg and San Antonio R. R. crossing, 13 meters W. of the tracks. (Note 20, p. 127.)

O<sub>8</sub>.—1 mile S. of *Harrisburg, Harris Co., Tex.*, 13¾ telegraph poles N. of mile board 7; in the SE. corner of a grade crossing; 18 meters S. of the Galveston, Houston and Henderson R. R. tracks, and 5 meters S. of the corner of the right-of-way fence; on range with the telegraph poles outside the right of way; set in clay. (Note 2, p. 126.)

M. M. 9.—3¼ miles SE. of *Harrisburg, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 15 meters SE. of mile board 9, and 15 meters SW. of the track. (Note 20, p. 127.)

P<sub>8</sub>.—4¼ miles SE. of *Harrisburg, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R., 35 meters NW. of mile board 10; on a steel and concrete bridge, 2 meters NE. of the tracks; in the center of the horizontal surface of the N. abutment. (Note 4, p. 127.)

Q<sub>8</sub>.—3¼ miles NW. of *Genoa, Harris Co., Tex.*, 8 meters SW. of mile board 11; on range with the telegraph poles outside of the right-of-way fence. (Note 11, p. 127.)

M. M. 12.—2¼ miles NW. of *Genoa, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 20 meters SE. of mile board 12 and 15 meters SW. of the tracks. (Note 20, p. 127.)

R<sub>8</sub>.—*Genoa, Harris Co., Tex.*, about 55 meters NW. of the station, on the right of way of the Galveston, Houston and Henderson R. R.; 8 meters SW. of the tracks, in the foundation of the water tank, on the SE. side, in the horizontal surface. (Note 1, p. 126.)

S<sub>8</sub>.—*Genoa, Harris Co., Tex.*, about 75 meters SE. of the Galveston, Houston and Henderson R. R. station and about 55 meters NE. of the tracks, in the corner of a fence. (Note 11, p. 127.)

M. M. 16.—1¾ miles SE. of *Genoa, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 20 meters NW. of mile board 16, and 15 meters SW. of the tracks. (Note 20, p. 127.)

M. M. 18.—3¾ miles SE. of *Genoa, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R., 20 meters SE. of mile board 18, and 15 meters SW. of the tracks. (Note 20, p. 127.)

T<sub>8</sub>.—1 mile NW. of *Webster, Harris Co., Tex.*, 12¾ telegraph poles NW. of mile board 21; 35 meters NE. of the Galveston, Houston and Henderson tracks, 15 meters SW. of an artesian well, on land owned by Harvey T. D. Wilson; set in clay. (Note 2, p. 126.)

U<sub>8</sub>.—*Webster, Harris Co., Tex.*, 100 meters SW. of the Galveston, Houston and Henderson R. R. station, in the corner of a fence at the E. corner of a street crossing; on land owned by Harvey T. D. Wilson. (Note 11, p. 127.)

M. M. 22.—½ mile SE. of *Webster, Harris Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 12 meters SE. of mile board 22, 15 meters SW. of the tracks. (Note 20, p. 127.)

V<sub>8</sub>.—*League City, Galveston Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 7 meters SE. of the station and 10 meters NE. of the tracks; on the top surface of a 7 by 8 inch stone post set in the parking. (Note 1, p. 126.)

W<sub>8</sub>.—2 miles southeast of *League City, Galveston Co., Tex.*, on the public highway, 11½ telegraph poles southeast of mile board 26, in the east corner of a grade crossing, ⅔ meter from the corner of the right-of-way fences; set in clay. (Note 2, p. 126.)

X<sub>8</sub>.—½ mile NW. of *Dickinson, Galveston Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R., 9½ telegraph poles SE. of mile board 28; in the center of the top surface of a concrete culvert, 6½ meters SW. of the tracks. (Note 1, p. 126.)

Y<sub>8</sub>.—*Dickinson, Galveston Co., Tex.*, in the park owned by the Galveston, Houston and Henderson R. R. Co.; 5 telegraph poles SE. of the station, 35 meters NE. of the Galveston, Houston and Henderson R. R. tracks, in the corner of a fence. (Note 11, p. 127.)

Z<sub>8</sub>.—½ mile SE. of *Dickinson, Galveston Co., Tex.*, 11 telegraph poles SE. of mile board 29; in the SW. corner of a grade crossing, 13 meters SW. of the Galveston, Houston and Henderson tracks; on land owned by C. Nolan; set in clay. (Note 2, p. 126.)

M. M. 32.—4 miles NW. of *Lamarque, Galveston Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; about 10 meters from mile board 32, 15 meters SW. of the tracks. (Note 20, p. 127.)

M. M. 34.—2 miles NW. of *Lamarque, Galveston Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 25 meters SE. of mile board 34, and 15 meters SW. of the tracks. (Note 20, p. 127.)

A<sub>9</sub>.—*Lamarque, Galveston Co., Tex.*, on the right of way of the Galveston, Houston and Henderson R. R., 40 meters NW. of the station and 7½ meters SW. of the tracks; in the concrete foundation of the water tank, in the center of the E. face, about 1 meter above ground. (Note 1, p. 126.)

B<sub>9</sub>.—½ mile SE. of *Lamarque, Galveston Co., Tex.*, 12½ telegraph poles SE. of mile board 36, 35 meters NE. of the Galveston, Houston and Henderson tracks; in the N. corner of a highway crossing, on land belonging to the Tarpey estate. (Note 2, p. 126.)

C<sub>9</sub>.—*Texas City Junction, Galveston Co., Tex.*, 2¾ miles SE. of Lamarque, 10 telegraph poles NW. of mile board 39, 35 meters SW. of the Galveston, Houston and Henderson R. R. tracks; in the corner of a fence; set in clay. (Note 2, p. 126.)

M. M. 41.—Near *Texas City Junction, Tex.*, on the right of way of the Galveston, Houston and Henderson R. R.; 25 meters SE. of mile board 41, 15 meters SW. of the tracks. (Note 20, p. 127.)



D<sub>9</sub>.—*Virginia Point, Galveston Co., Tex.*, on the right of way of the Santa Fe R. R.; 30 meters NW. of the trestle, 8 meters SW. of the tracks, on range with the telegraph poles; set in sand. (Note 2, p. 126.)

E<sub>9</sub>.— $2\frac{1}{2}$  miles W. of *Galveston, Galveston Co., Tex.*, 100 meters S. of the Galveston, Houston and Henderson R. R. tracks; at the SW. corner of the first grade crossing to the eastward of the stock pens. (Note 11, p. 127.)

F<sub>9</sub>.—*Galveston, Galveston Co., Tex.*,  $1\frac{1}{4}$  miles W. of the Union Depot, in the concrete foundation of the Galveston, Houston and Henderson R. R. shops; on the N. side, back of a telegraph pole; 9 meters from the E. end, in a beveled surface. (Note 1, p. 126.)

G<sub>9</sub>.—*Galveston, Galveston Co., Tex.*, a Santa Fe R. R. B. M., at the NE. corner of B and Twenty-fifth streets; in a steel window sill on the W. side of the Sealy Building,  $1\frac{1}{2}$  meters from the S. side of the building,  $2\frac{1}{2}$  decimeters from the south edge of the sill. (Note 13, p. 127.)

City.—*Galveston, Galveston Co., Tex.*, on Eighth street, between Mechanic and Strand streets; at the SE. corner of an alley and the street; the top of an arrowhead on a hydrant.

Tidal 1.—*Galveston, Galveston Co., Tex.*, at the SW. corner of the U. S. coal wharf at Fort Point; the 10-foot mark of the fixed tide staff, nailed to a pile.

Tidal 2.—*Galveston, Galveston Co., Tex.*, in the pile alongside of the fixed tide staff; a horizontal mark made through the center of the head of the one of two spikes nearer the tide staff.

Tidal 3=U. S. E. B. M. A.—*Galveston, Galveston Co., Tex.*; in the western face of the concrete foundation wall of the cable tank, near the steps leading into the shed house; the top of a brass bolt, the projecting portion of which has been filed flat for the foot of the leveling rod.

Tidal 4.—*Galveston, Galveston Co., Tex.*; a horizontal line cut in the head of a brass bolt set with its head flush with the concrete wall of the cable tank, about 6 inches above Tidal 3.

Tidal 5.—*Galveston, Galveston Co., Tex.*, established by the Corps of Engineers, U. S. Army, in 1890; the top of the NE. bolt of the NW. bearing pile of the Fort Point Light-House.

Tidal 6.—*Galveston, Galveston Co., Tex.*, about 6 feet E. of the trestle bent marked 100. (Note 19, p. 127, the iron rail reaching nearly to the surface of the tracks.)

Tidal 7.—*Galveston, Galveston Co., Tex.*, about 14 feet N. from trestle bent marked 90. (Note 19, p. 127.)

Tidal 8.—*Galveston, Galveston Co., Tex.*, about 28 feet N. from trestle bent marked 80. (Note 19, p. 127.)

Tidal 9=U. S. E. B. M. Fence Line.—*Galveston, Galveston Co., Tex.*; between 400 and 500 feet southward from the office building at Fort Point, Tex.; in the center of the S. jetty, immediately below the railroad trestle; the top of a brass bolt set in a box of concrete, the head of the bolt projecting about an inch. A stringer of the railroad track was directly above the bolt in 1906.

Tidal 10.—*Galveston, Galveston Co., Tex.*, at a point near trestle bent marked 60. (Note 19, p. 127.)

Tidal 11.—*Galveston, Galveston Co., Tex.*, about 14 feet S. from the trestle bent marked 50. (Note 19, p. 127.)

Tidal 12.—*Galveston, Galveston Co., Tex.*, about 29 feet N. from trestle bent marked 40. (Note 19, p. 127.)

Tidal 13.—*Galveston, Galveston Co., Tex.*, near the trestle bent marked 30. (Note 19, p. 127; covered by a railroad tie, a portion of which was cut away to reach the B. M.)

Tidal 14.—*Galveston, Galveston Co., Tex.*, about 12 feet S. from trestle bent marked 20. (Note 19, p. 127; the top of the rail being almost covered by a railroad tie.)

Tidal 15.—*Galveston, Galveston Co., Tex.*, about 10 feet S. from trestle bent marked 10. (Note 19, p. 127.)

Tidal 16.—*Galveston, Galveston Co., Tex.*, in the concrete walk at the NW. corner of the hospital grounds on Ninth street, about 28 inches from a telegraph pole and about 4 inches from the NW. corner of the walk; the top of a wire nail.

Tidal 17.—*Galveston, Galveston Co., Tex.*, the highest point of the diagonal line forming the intersection of the S. and W. concrete walls about the hospital grounds, corner of Ninth and Strand streets.

Tidal 18.—*Galveston, Galveston Co., Tex.*, at the NE. corner of the Hendley Building, corner of Twentieth and Strand streets; on the top of the stone water table, at the edge where the corner has been chipped off. This B. M. is the city datum.

Tidal 19.—*Galveston, Galveston Co., Tex.*, on the N. side of the Hendley Building, corner of Twentieth and Strand streets, about a foot from the NE. corner of the building, and 4 feet above Tidal 18; a small hole in the center of the face of the head of a copper bolt set flush with the wall.

## DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN GRAFTON AND CHICAGO, ILL., 1902-4.

[These descriptions are published in House Document No. 263, Fifty-ninth Congress, first session, and are republished here. Slight changes are made for the purpose of indexing and for condensation by means of general notes.]

P. B. M. 4.—*Grafton, Jersey Co., Ill.* (See App. 8, Report for 1899, p. 719.)

P. B. M. 3.—*Grafton, Jersey Co., Ill.* (See App. 8, Report for 1899, p. 719.) In building the tower to the church in 1901, the stone doorstep was moved from its position in 1880, at the front of the church, some 6 feet E. to the front of the tower.

P. B. M. 2.—Near *Grafton, Jersey Co., Ill.* (See App. 8, Report for 1899, p. 719.) The B. M. is in the top of a dressed stone post.

T. B. M. 2.—In the natural rock, on the northerly side of highway running along the foot of the bluffs on the L. B. of the Illinois River to the W. of *Grafton, Ill.*, the bench being 7.5 feet from center of wagon track and about 3.75 feet above it. In the 100 feet from and easterly of the bench the highway makes a bend of about 90° around the foot of the rocky ledge at this point. William Bennett's house stands on the hillside, about 166 feet northwesterly from the bench, as measured along the wagon track, to a point opposite the center of his house. Southerly of the bench, between the highway and the river, is a cleared field with a stone fence along the highway and from the highway to the river on the E. side of the field. The bench is 1 024 feet westerly of, or above, Deer Plain Ferry, as measured along the wagon track of highway, from a point opposite the ferry landing. (Note 42, p. 129.)

P. B. M. 1.—Stone, pipe, and cap (see note 41, p. 129), set in the southwesterly corner of the Hartford Church cemetery, back of Carsons Ldg. on the river, and about 5.3 miles W. of the Catholic Church in *Grafton, Ill.* The bench is 117.8 feet westerly from the NW. corner of Hartford Church and 88 feet northeasterly from the center of the highway following the foot of the bluffs. A white-oak tree, 1.5 feet in diameter, stands 21.5 feet (center) northeasterly, and a black-oak tree, 2.5 feet in diameter, stands 67.8 feet (center) northeasterly of the bench but less to the E. than the white oak, both trees being in the cemetery. In the NE.  $\frac{1}{4}$  sec. 16, T. 6 N., R. 13 W., *Jersey County, Ill.*

T. B. M. 8.—Near *Rosedale, Jersey Co., Ill.*; highest point in a square cut on the top of the southwesterly part of a limestone boulder projecting from the ground on the easterly side of the northerly and southerly highway following the foot of the bluffs. There is a small rise in the highway just to the N. of the boulder. The bench is about 375 feet northerly from the southerly end of an osage orange hedge fence on westerly side of highway, about 285 feet northerly from the southerly end of a stone fence in the hedge row, 60.5 feet easterly from said stone fence, and 27 feet easterly from center of present wagon track. In sec. 33, T. 7 N., R. 13 W., *Jersey Co., Ill.*, about 3 000 feet N. from the E. and W. line between Quarry and Rosedale townships. The bench is marked U. S. The U is on the northwesterly slope of the boulder and the S on the southeasterly slope, the boulder coming to an edge at the top, which edge extends in a northeasterly and southwesterly direction.

T. B. M. 9.—Near *Rosedale, Jersey Co., Ill.*, on a limestone boulder measuring about 4.5 feet in its E. and W. dimension and about 5 feet in its N. and S. dimensions, and having an approximately flat upper surface. The boulder is in the highway running northerly and southerly along the foot of the bluffs, the bench being 8 feet E. from center of wagon track and 2 feet W. from easterly highway fence line. There is another good-sized boulder 37 feet (center) southerly from B. M. on E. side of wagon track, to which it presents a sloping face. The highway here passes over a small rise in the ground and by a number of trees in its vicinity to the westward. Of these, a 16-inch elm stands 24.5 feet (center) southwesterly, a 14-inch elm 53.5 feet (center) northwesterly, and a 12-inch honey locust, standing just E. of easterly highway fence, 59.5 feet (center) northerly from bench. The house and barn of Mr. A. Ridenour are about 650 feet southerly from bench. In sec. 28, T. 7 N., R. 13 W., *Jersey Co., Ill.* (Note 42, p. 129.)

P. B. M. 2.—Top of copper bolt leaded vertically into a large rock on the E. side of the highway running along the foot of the bluffs. The rock projects into the highway about 3 feet beyond the fence line. In general dimensions this rock is 7 feet N. and S., 23 feet E. and W. and 5.5 feet above ground. The bolt is near the NW. corner of the rock, being 8 inches from its northerly and 10 inches from its westerly side, and about 3.25 feet above ground. It is 404 feet northerly from the NE. corner of William Harris's log house. In sec. 21, T. 7 N., R. 13 W., *Jersey Co., Ill.*, about 0.7 of a mile S. of *Rosedale* post-office. The bench is marked U. S., the bolt being in the center of a square between the letters.

T. B. M. 10.—On a rock on the E. side of the highway running along the foot of the bluffs, at a point about opposite midway between James Wedding's house and barn, which are about a quarter of a mile above *Rosedale* post-office. This rock is near the foot of the bluffs and presents a sloping face downward to the W. The bench is about a third of the way up the sloping face. It is 85.7 feet northeasterly from the NE. corner of Mr. Wedding's house and 112.8 feet southeasterly from the SE. corner of his barn. In sec. 17, T. 7 N., R. 13 W., *Jersey Co., Ill.* (Note 42, p. 129.)

P. B. M. 3.—Stone, pipe, and cap (see note 41, p. 129), set in a field, 5.3 feet S. from the center of the rail fence on the S. side of the road leading from the N. and S. highway running along the foot of the bluffs to Jones Ldg. at the foot of Twelvemile Island in the Illinois River. The pipe is 177.8 feet southwesterly from the SE. corner of James Wedding's house and about 220 feet westerly from the intersection of the wagon track of the bluff highway with the road to the river. In the SE.  $\frac{1}{4}$  SE.  $\frac{1}{4}$  sec. 17, T. 7 N., R. 13 W., *Jersey Co., Ill.*, and about  $\frac{1}{4}$  mile above *Rosedale* post-office. It is also a triangulation station.

P. B. M. 4.—In the top of the W. end of the S. stone abutment of the iron highway bridge over Otter Creek, about  $\frac{1}{4}$  mile N. of Otter Creek schoolhouse and about  $\frac{3}{4}$  mile S. of *Nutwood* post-office, *Jersey Co., Ill.* (Note 43, p. 129.)

P. B. M. 5.—Stone, pipe, and cap (see note 41, p. 129), set in the SE. corner of the front door yard of A. O. Auten's farmhouse, now occupied by William Lawler, at *Nutwood* post-office, *Jersey Co., Ill.* It is 50 feet southeasterly from the SE. corner of the front part of the house and about 362 feet westerly from the center of front door of the post-office.

P. B. M. 6.—Near *Spankey*, *Jersey Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set near the N. fence line of a road leading westward, through sec. 17, T. 8 N., R. 13 W., *Jersey Co., Ill.*, from the N. and S. highway along the foot of the bluffs. The bench is about 1 675 feet westward from the intersection of these roads, in relatively low ground. It is also a triangulation station.

P. B. M. 7.—Stone, pipe, and cap (see note 41, p. 129), set in the dooryard of Joseph A. Clark's farmhouse, *Green Co., Ill.*, on the northerly bank of Macoupin Creek, in the NW. angle of intersecting roads at *Spankey*. The pipe is 10.3 feet E. of the range of the front or E. side of Mr. Clark's house, 14.5 feet S. of the range of its S. end, and 17.6 feet southeasterly from its SE. corner.

T. B. M. 27.—On the top of a fragment of rock lying at the foot of the bluffs, where they make nearly a right angle in their general direction, about  $\frac{1}{4}$  mile W. of Charles Keeley's stone farmhouse, and about 1.5 miles N. of *Spankey* post-office. The bench rock is 16 feet easterly from the E. fence line of highway, on the concave side thereof, where it bends around the angle in the bluff line. This rock is about 6 feet in average length, 3 feet in average width, and about 3 feet in height. The bench is near its southerly end. In sec. 21, T. 27 N., R. 13 W., *Greene Co., Ill.* (Note 42, p. 129.)

P. B. M. 8.—Near *Spankey*, *Jersey Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set 3 feet E. of the E. fence and 9 feet N. of the S. front fence of the front dooryard of Mrs. J. Sheuten's farmhouse, from the SE. corner of which the pipe is distant 156.5 feet southeasterly. In the NE.  $\frac{1}{4}$  sec. 17, T. 9 N., R. 13 W., *Greene Co., Ill.*

P. B. M. 9.—Stone, pipe, and cap (see note 41, p. 129), set in the NE. corner of the schoolhouse yard in *Eldred, Ill.* The pipe is 98.7 feet northeasterly from the NE. corner and 32.6 feet E. of the range of the E. or front side of schoolhouse. It is 3 feet S. of the N. fence and 3 feet W. of the E. fence of schoolyard, and 13 feet W. of the center of a sycamore tree. In sec. 28, T. 10 N., R. 13 W., *Greene Co., Ill.*

P. B. M. 10.—Near *Eldred*, *Greene Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set near the NW. corner of Ed. V. Robley's front dooryard on the E. side of the N. and S. highway along the foot of the bluffs. The pipe is 87.65 feet northwesterly from the NW. corner, 108.5 feet northwesterly from the SW. corner, 31.5 feet N. of the range of the N. end, and 81.4 feet W. of the range of the W., or front, side of his house. It is 7 feet E. of the stone retaining wall along the front of the dooryard. In sec. 9, T. 10 N., R. 13 W., *Greene Co., Ill.*

P. B. M. 11.—About 1 mile S. of *Bridgewater*, *Greene Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set 28.6 feet W. from the range of the W. or front side of W. Alex. Boirum's farmhouse, 13 feet N. from the range of the N. end and 31.6 feet northwesterly from the NW. corner of said house. The pipe stands near the NW. corner of his front dooryard, but outside of it, in an angle in the easterly fence line of the highway along the foot of the bluffs, being 2.7 feet W. of the front fence and 4.2 feet S. of the prolongation of the N. fence of dooryard. In the NE.  $\frac{1}{4}$  sec. 28, T. 11 N., R. 13 W., *Greene Co., Ill.*, about  $\frac{1}{2}$  mile N. from Apple Creek bridge.

P. B. M. 12.—Stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of the headquarters house of the Hartwell Ranch management, 0.7 foot N. from the range of the S. side, and 35 feet E. from the E. or front side of house, being 2.25 feet W. from the front dooryard fence. In sec. 9, T. 11 N., R. 13 W., *Greene Co., Ill.*, about 2.5 miles S. of *Pegram (Hillview)* and 1.5 miles N. of *Bridgewater*.

P. B. M. 13.—Stone, pipe, and cap (see note 41, p. 129), set 50 feet square out, southerly, from a point on the center line of the Chicago and Alton Railroad track, 1 650 feet westerly along the track from the range of the W. end of the passenger depot at *Pegram (Hillview)*, *Greene Co., Ill.* It is also about 150 feet northerly from the wagon ford of Hurricane Creek just westerly of *Pegram*, and about in line with the general direction of the bluffs to the N. and S. of the hollow in which *Pegram* is situated.

P. B. M. 14.—Stone, pipe, and cap (see note 41, p. 129), set in the front yard of a tenant house owned by George Burg and occupied by O. B. Walls, on the W. side of the highway along the foot of the bluffs. The bench is 27 feet S. of the range of the S. side of tenant house (double log house), 30 feet E. of the range of its E. end, and 41.4 feet southeasterly from its SE. corner, in sec. 11, T. 12 N., R. 13 W., about 1.7 miles S. of *Greene-Scott county line* and about 3.5 miles above *Pegram (Hillview)*, *Greene Co., Ill.*

P. B. M. 15.—Near *Hillview, Greene Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set in the NW. corner of the front dooryard of the farm residence of E. C. Adams on the E. side of the highway just S. of where it passes well up on the side of the hills instead of along the foot of the bluffs as usual. The bench is 2 feet E. of front fence and 1.1 feet S. of N. fence of dooryard; it is 149 feet W. of the range of the W. or front side of house and about 9.5 feet N. of the range of its N. end; it is 161 feet northwesterly from the SW. corner of his house and 119 feet southerly from an elm tree, 3.2 feet in diameter, standing in the front dooryard of the "old house" just to the NW. of the farm residence of E. C. Adams. In sec. 26, T. 13 N., R. 13 W., *Scott Co., Ill.*, and about 1.5 miles S. of *Big Sandy Creek*.

P. B. M. 16.—Near *Glasgow, Scott Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the front yard of a house owned by Charles H. Condit and occupied by John W. Davis, 197 feet N. from the NE. corner of the house, and on the range of its N. end. The pipe is 105 feet southwesterly from a black-oak tree, about 2 feet in diameter, in field W. of highway. It is 2.5 feet S. of S. fence line of the E. and W. highway between secs. 10 and 15, T. 13 N., R. 13 W., *Scott County, Ill.*, or 10.5 feet S. of center of wagon track.

P. B. M. 17.—Near *Bloomfield, Scott Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of J. T. Wilson's farm residence, 2.25 feet E. of front fence and 17.65 feet S. of NW. corner post of yard fence. The pipe is 21.2 feet N. of the range of N. side, 50.7 feet W. of the range of W. or front side, and 54.6 feet northwesterly from the NW. corner of his residence. In sec. 34, T. 14 N., R. 13 W., *Scott Co., Ill.*

P. B. M. 18.—Near *Bloomfield, Scott Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set 2.75 feet E. of E. fence of N. and S. highway, 151 feet N. of center line of E. and W. jog in highway, 137.5 feet N. of the range of a fence said to be on line between secs. 8 and 17 and 284 feet northwesterly from the SW. corner of William H. Price's new house. The pipe is in the NW. corner of a small orchard field to the S. of a timber lot. In the SE.  $\frac{1}{4}$  sec. 8, T. 14 N., R. 13 W., *Scott Co., Ill.*

P. B. M. 19.—Stone, pipe, and cap (see note 41, p. 129) set near the SW. corner of the front dooryard of Harvey Green's farm residence about  $\frac{1}{2}$  mile northerly from *Orrille, Ill.*, and about  $\frac{1}{8}$  mile E. from the covered wooden bridge over Mauvestere Creek on the highway along the bluffs. The pipe is 53.3 feet W. of the range of the S. part of W. side, 74.7 feet S. of the range of the S. (front) side, and 92 feet southwesterly from the SW. corner of his house. It is 2.25 feet N. of front fence of dooryard, 14.8 feet easterly from SW. corner post of dooryard, and 9.6 feet southeasterly from a soft maple tree in yard. In sec. 29, T. 15 N., R. 13 W., *Scott Co., Ill.*

P. M. B. 20.—Stone, pipe, and cap (see note 41, p. 129) set on the NW. corner of the Methodist Protestant Churchyard situated on the NW. corner of Bluff and Charles streets, in *Bluffs, Scott Co., Ill.* The pipe is in range with the W. side of church, 82.1 feet N. from its NW. corner and 87.9 feet northwesterly from its NE. corner. It is 44.5 feet W. of W. fence line of Bluff street and 2 feet S. of N. churchyard fence.

P. B. M. 21.—Stone, pipe, and cap (see note 41, p. 129) set in the NW. corner of the cemetery adjoining the New Salem Baptist Church, about 4 miles N. from the village of *Bluffs*, on the E. side of the bluff highway. The pipe is 63.7 feet N. from the NW. corner of church, 67.8 feet northwesterly from its NE. corner, 2.6 feet E. of the range of its W. side and from W. fence of cemetery, 2.1 feet S. of N. fence of cemetery, 27 feet SE. from white oak tree, and 30 feet northerly from a black oak tree, both trees being outside the cemetery. In sec. 25, T. 16 N., R. 13 W., *Morgan Co., Ill.*

P. B. M. 22.—Near *Meredosia, Morgan Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the northerly corner of the front dooryard of H. A. Brockhause's farmhouse on the SE. side of the highway along the bluffs, about 1.2 miles southwesterly from McKendree Chapel. The pipe is 75.5 feet northerly from the N. corner of house, being 65 feet NW. of the range of the NW. or front side, and 37.7 feet NE. of the NE. end of house. It is 4.4 feet SW. from NE. fence, and 2.8 feet SE. from NW. or front fence of yard. T. B. M. 105 is 135.3 feet southwesterly from it in the same yard. In sec. 8, T. 16 N., R. 12 W., Morgan Co., Ill.

P. B. M. 23.—Near *Lydda, Cass Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the NW. corner of front dooryard of the large square house on the Corcoran estate, about  $\frac{1}{4}$  mile SE. from Waggoner's bridge over Indian Creek. The pipe is 45.8 feet from the NW. corner of house, 22.1 feet N. of the range of the N. side, and 40.2 feet W. of the range of the W. side of house. It is 341 feet E. of the E. hedge fence of highway and 178.8 feet southerly from a cottonwood tree, 2.4 feet in diameter, standing in field, 207.75 feet northwesterly from the NW. corner of the above-mentioned house. In sec. 29, T. 17 N., R. 12 W., Cass Co., Ill.

P. B. M. 24.—Near *Beardstown, Cass Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the NE. corner of the cemetery near the NE. corner of the SW.  $\frac{1}{4}$  sec. 9, T. 17 N., R. 12 W., Cass Co., Ill., and which adjoins the Union Baptist Church (Black Oak Grove Church). The pipe is 2.4 feet S. of the N. and 2.7 feet W. of the E. iron fence surrounding the cemetery. It is 98.5 feet N. of the N. side of church and 2.8 feet W. of the range of its E. or front end. It is 37.4 feet southeasterly from the SE. corner of schoolhouse and 17.3 feet E. of the range of its front end.

P. B. M. 25.—Stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of S. H. Gust's farmhouse, 3.15 feet N. of S. fence of yard, 33.8 feet W. of W. fence of N. and S. highway, 97 feet from the SE. corner of his house, being 41.8 feet S. of the range of the S. side, and 89.4 feet E. of the range of the E. (front) side of house, and 110.6 feet southerly from a black oak tree 2 feet in diameter standing in a grove of oaks, 95.7 feet from the NE. corner of Gust's house and 14 feet W. from the W. fence of the N. and S. highway. In the SE.  $\frac{1}{4}$  SW.  $\frac{1}{4}$  sec. 22, T. 18 N., R. 12 W., Cass Co., Ill., about 2 miles below *Beardstown*.

B. M. (wye level).—*Beardstown, Cass Co., Ill.*, "on top of south side of parapet bridge approach at E. end of wagon bridge." Marked U. S. B. M.

P. B. M. 26.—In top of stone step of main entrance to the Odd Fellows' brick building, on the E. corner of Main and Washington streets, in *Beardstown, Ill.* The bolt is 0.5 foot back from the front face and 0.4 foot S. from the N. end of stone step. (Note 43, p. 129.)

P. B. M. 27.—In top of stone step of main entrance to First State Bank building, on the W. corner of Main and State streets, in *Beardstown, Ill.* The bolt is 0.4 foot back from front edge and 1.4 feet N. from S. end of stone step. (Note 43, p. 129.)

P. B. M. 28.—Stone, pipe, and cap (see note 41, p. 129) set near the SE. corner of the Lutheran cemetery, on the N. side of the highway running E. from *Beardstown, Ill.* The pipe is 2.2 feet N. of the S. (front) fence and 5.5 feet W. of the E. fence of cemetery. It is 17.6 feet E. from a black oak tree, 1.96 feet in diameter, 27.1 feet N. about 80° E. from a black oak of equal diameter, and 155.6 feet NE. from another black oak tree, 1.85 feet in diameter, on the S. side of the highway. In sec. 12, T. 18 N., R. 12 W., Cass Co., Ill., about  $\frac{1}{2}$  mile W. of township line.

P. B. M. 29.—Near *Beardstown, Cass Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the SE. corner of the front dooryard of A. H. Krohe's farmhouse, on the N. side of the highway following the S. foothills of the Sangamon Valley. The pipe is 57.8 feet SE. from the SE. corner of the house, being 34.7 feet E. of the range of the E. side and 46.3 feet S. of the range of the front side of house. It is 2.6 feet N. of front fence, 2.8 feet W. of the E. fence of dooryard, and 30 feet SE. from a double cottonwood tree, 5 feet in diameter. In sec. 12, T. 18 N., R. 11 W., Cass Co., Ill.

P. B. M. 30.—Stone, pipe, and cap (see note 41, p. 129) set in the NE. corner of the front dooryard of Robert Fielden's farm residence on the southeasterly side of the highway following the S. foothills of the Sangamon Valley, 97 feet N. from the NE. corner of the house, being 95 feet northerly from the range of the northerly, or front, side and 18.5 feet easterly from the range of the easterly end of house. It is 3 feet inside the front fence and 2.7 feet from the easterly fence of yard. In sec. 10, T. 18 N., R. 10 W., Cass Co., Ill., about 3.25 miles SW from *Chandlerville*.

P. B. M. 31.—Stone, pipe, and cap (see note 41, p. 129) set in the back yard of Mrs. S. L. B. Chandler's residence, on the N. side of River street, in *Chandlerville, Ill.*, adjoining on the E. the Chicago,

Peoria and St. Louis R. R. right of way. The pipe is 26.75 feet E. of center of track, 2.2 feet E. of E. right-of-way fence, 149 feet N. of N. fence of River street, and 95 feet from the NW. corner of the square upright part of Mrs. Chandler's residence, being 79 feet N. and 52.2 feet W. from the corner.

P. B. M. 32.—Stone, pipe, and cap (see note 41, p. 129) set near the NW. corner of the front doorway of a farmhouse, owned by George Bell, situated near the SW. corner of sec. 8, T. 19 N., R. 9 W., *Mason Co., Ill.*, just to the NE. of the Chicago, Peoria and St. Louis R. R. depot building at *Saidora*. The bench is 352 feet NE. of the NE. corner of depot building and 71.1 feet northwesterly from the NW. corner of house, being 44.8 feet N. of the range of the N. side of house and 48.25 feet W. of the range of W. line of front piazza. The position of surrounding trees relative to bench is as follows: An 18-inch elm stands 18.35 feet southwesterly, a 15-inch elm stands 20.75 feet northwesterly, a 10-inch elm stands 14 feet northerly, a 20-inch elm stands 31.5 feet northeasterly, and an 18-inch pine stands 61.2 feet southeasterly of bench.

P. B. M. 33.—Stone, pipe, and cap (see note 41, p. 129) set in the public square at *Bath, Ill.*, 26.5 feet SE. from the NW. fence line of square, 66.3 feet SW. from the NE. fence line of square, 164.3 feet southward from the S. corner of Moses Morris's brick store, 39.35 feet NE. from the range of the NE. side, 121.9 feet NW. from the range of the NW. end, and 127.3 feet northwesterly from the N. corner of town hall. The position of three consecutive trees in the row of shade trees along the NW. side of the square relative to the bench is as follows: A 24-inch soft maple stands 39.25 feet southerly, a 24-inch elm stands 23.4 feet northwesterly, and an 18-inch elm stands 29.7 feet northerly of bench.

P. B. M. 34.—Center of cross cut on cast-iron water table along the front of Moses Morris's brick store on the N. corner of Oak and Main streets in *Bath, Ill.* The cross is 7.6 feet NE. from the S. corner of the store, 0.16 foot SW. from the first iron column NE. from said corner, and 0.08 foot back from front edge of water table. Marked P B M U S+.

P. B. M. 35.—Stone, pipe, and cap (see note 41, p. 129), set in the E. and W. highway between secs. 27 and 28, T. 21 N., R. 9 W., *Mason Co., Ill.*, where this highway crosses the Chicago, Peoria and St. Louis R. R. at *Matanzas* elevator. The bench is 4.7 feet N. of S. hedge fence of highway, and about on the range of the NW. railway right-of-way fence line, being 49.55 feet, square out, from center of track.

P. B. M. 36.—Near *Havana, Mason Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set 48.7 feet E., square out, from center of Chicago, Peoria and St. Louis R. R. track and 1 189 feet northward along the track from its intersection with center of highway between secs. 12 and 13, T. 21 N., R. 9 W., *Mason Co., Ill.* It is on land of Henry Neteler, 269 feet W. of the range of the W. fence and 23 feet N. of the range of the N. fence of his dooryard, 196.6 feet northward along E. right-of-way fence line from center of gateway of his private drive, and 112 feet southeastward from the SW. one of a group of three black walnut trees, this one 0.8 foot in diameter, standing at the extreme S. end of woods. An 18-inch black oak stands 26.2 feet northeasterly, a 14-inch black oak stands 13.6 feet southerly, a 14-inch black oak stands 22.4 feet easterly of bench.

P. B. M. 37.—In top of S. end of E. pier of iron highway bridge over Illinois River at *Havana, Ill.* The bolt is 1.9 feet N. from S. end and 2.98 feet E. from W. side of pier. (Note 43, p. 129.)

P. B. M. 38.—Center of cross cut on top of cast-iron water table of brick post-office building, at SE. corner of Plum and Main streets, in *Havana, Ill.* The cross is 1.55 feet S. of the NW. corner of base of cast-iron corner column and 0.15 foot back or E. from front edge of water table. Not marked.

P. B. M. 39.—In top of stone doorstep of main S. entrance to county office building situated on the public square and facing Main street, in *Havana, Ill.* The bolt is 0.35 foot N. from S. edge of step and 0.6 foot E. of brick jamb on W. side of doorway. (Note 43, p. 129.)

P. B. M. 40.—Top of copper bolt leaded vertically into top of stone water table in front of *Mason County Bank* building on N. side of Main street in *Havana, Ill.* The bolt is 187 feet W. from the W. side of Plum street, 0.77 foot W. of W. face of iron column first W. of bank door and 0.18 foot back from front edge of water table. It is marked U S P B M, with the bolt below the B and the U and S on either side of the bolt.

P. B. M. 41.—Near *Havana, Mason Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set in the SW. corner of A. H. Jones's farm, 2.1 feet N. of the N. fence line of E. and W. highway through the center of sec. 21, T. 22 N., R. 8 W., *Mason County, Ill.*, and 7.8 feet E. of N. and S. hedge fence on W. line of said section. A 25-inch black oak (in highway) stands 17.15 feet eastward, a 19-inch black oak stands 8.85 feet northeasterly, and a 22-inch black oak stands 16.25 feet northward of bench. It is also 207 feet westward from an elm tree, 2.9 feet in diameter, standing in the E. and W. highway.

T. B. M. 186.—Near *Havana, Mason Co., Ill.*, on the W. end of S. stone abutment of iron highway bridge over Quiver Creek in sec. 22, T. 22 N., R. 8 W., *Mason Co., Ill.*, about  $\frac{1}{4}$  mile NNE. from Quiver schoolhouse. (Note 42, p. 129.)

P. B. M. 42.—Near *Liverpool, Fulton Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set in the highway running along the brow of the hills on the SE. side of bottom lands and slough, to the NE. of the head of Quiver Lake in a general NE. direction, but N. and S. for about 150 feet in the immediate vicinity of the bench. It is in the NW.  $\frac{1}{4}$  sec. 11, T. 22 N., R. 8 W., *Mason County, Ill.*, on lands of O. A. Graham. The pipe is 15 feet E. of center of wagon track, 15 feet N. of N. side of a large field, having woods on its N. and W. sides, and 5.4 feet W. from a long N. and S. osage orange hedge on the W. side of said field. Mr. Graham's private road branches from the highway about 50 feet S. of the bench and continues S. along W. side of hedge.

P. B. M. 43.—Stone, pipe, and cap (see note 41, p. 129), set in the NW. corner of the front dooryard of Joseph Brown's log house on the NE. corner of sec. 6, T. 22 N., R. 7 W., *Mason County, Ill.*, about 4.5 miles N. of *Topeka*. The bench is 37.5 feet N. of the range of N. side of house, 34.5 feet W. of the range of its W. end, 46 feet northwesterly from a 24-inch black-oak tree in yard W. of house, 36.7 feet southerly from a double black-oak tree standing about in center of E. and W. town-line road, and 47 feet from a black-oak tree, 0.75 foot in diameter, standing near the SW. corner of sec. 32, T. 23 N., R. 7 W.

P. B. M. 44.—Near *Manito, Mason Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set in front dooryard of J. A. Schulte's cottage, occupied by Peter Schutz, situated at the SE. angle in the highway where, in coming from the S., it turns E. along the Mason-Tazewell County line. Here the road runs close to the brow of the bluffs to the E. of the head of Clear Lake. The bench is 21.8 feet WNW. from the NW. corner of cottage, being 10.8 feet N. of the range of N. end and 19.5 feet W. of the range of W. or front side of cottage. It is 60 feet ESE. of a 6-inch black-oak tree on opposite side of highway and 154 feet southerly from a black-oak tree 1.4 feet in diameter, standing in field at brow of bluffs.

P. B. M. 45.—Near *Marshall's Landing, Tazewell Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set in the SW. corner of the front dooryard of Benjamin F. Gorman's farmhouse, situated in the NW.  $\frac{1}{4}$  sec. 11, T. 23 N., R. 7 W., *Tazewell County, Ill.*, on the N. side of E. and W. highway, and a short distance below the eastward end of Copperas Creek dike. The bench is 62.3 feet from the SW. corner of house, being 13 feet W. of the range of the W. side, and 61.2 feet S. of the range of the S. or front side of house. A 17-inch black oak stands 8.6 feet W., a 13-inch black oak 13.3 feet about  $10^{\circ}$  E. of N., a 12-inch black oak 23.2 feet about  $75^{\circ}$  E. of N., and a 13-inch black oak 13.65 feet WNW. from the bench.

P. B. M. 46.—Stone, pipe, and cap (see note 41, p. 129), set in the SW. corner of the large front dooryard of the country residence of Edward S. Haas, which is NE. of *Marshall's Landing*, 2.85 feet E. of E. fence and 2.7 feet N. of S. or front fence of yard; 637.7 feet southwestward from the SW. corner of his residence, and 327 feet E. from the SE. corner of the old Eli Haas farmhouse; an 8-inch elm stands 91.1 feet N., a 6-inch hackberry 174 feet NE., and a 6-inch hackberry 161.1 feet ENE. from the bench. In the SE.  $\frac{1}{4}$  sec. 30, T. 24 N., R. 6 W., *Tazewell County, Ill.*, approximately 450 feet eastward from the S. quarter corner of said section.

P. B. M. 47.—Near *Gales Landing, Tazewell Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set on the SE. side of the highway along the foot of the bluffs to the E. and NE. of the upper part of Spring Lake, 2.1 feet NW. from its SE. fence line and about 12 feet W. of line between secs. 21 and 22, T. 24 N., R. 6 W., *Tazewell County, Ill.*, as defined by fence line on top of hill, which fence, in coming down the hillside, deflects to the pipe at the highway. The bench is near the NE. corner of John and Miriam Brewer's land and at an estimated distance of 700 feet NNE. from their farmhouse.

T. B. M. 228.—Near *Stoehrs, Tazewell Co., Ill.*, on the top of coping stone at NW. end of SW. stone abutment of iron highway bridge over New Mackinaw River, about  $\frac{1}{4}$  mile N. of the center of sec. 24, T. 24 N., R. 6 W., *Tazewell County, Ill.*, and about 5.5 miles SW. of *Pekin*. (Note 42, p. 129.)

U. S. G. S.—Near *Stoehrs, Tazewell Co., Ill.*, about 5.5 miles SW. of *Pekin, Tazewell County, Ill.*, on the SE. end of the SW. stone abutment of the iron highway bridge over New Mackinaw River, being the center of the cross on the top of bronze tablet cemented into coping stone.

P. B. M. 48.—Stone, pipe, and cap (see note 41, p. 129), set on the right of way of the Chicago, Peoria and St. Louis R. R., 45.25 feet SE., square out, from center of track, 38.5 feet S. from center line (as defined by fences) of the E. and W. highway between secs. 9 and 16, T. 24 N., R. 5 W., *Tazewell*

*County, Ill.*, and 130.7 feet southeasterly from a wild-cherry tree 1.75 feet in diameter, standing in the N. and S. fence line through the center of the SW.  $\frac{1}{4}$  sec. 9. A 12-inch wild cherry (on right of way) stands 96.6 feet NE. and a 6-inch elm (on north fence line of highway) stands 121 feet NW. of bench. About 3 miles SW. from *Pekin*.

T. B. M. 235.—On top of stone doorstep of large door (10.4 feet wide between wooden jambs), about midway of the side facing the Chicago, Peoria and St. Louis R. R. track, of the main building of the Illinois Sugar Refining Co.'s works, 1.5 miles SW. of *Pekin, Ill.* The mark is 0.55 foot back from front edge of step and 0.37 foot from NE. jamb. (Note 42, p. 129.)

T. B. M. 237.—On top of the stone forming the northwesterly corner of brick foundation of Smith, Hippen & Co.'s elevator at foot of hills, at river, in *Pekin, Ill.* The bench is 0.37 foot W. of W. side and 0.35 foot S. of N. end of elevator. (Note 42, p. 129.)

P. B. M. 49.—In top of coping stone on N. end of E. abutment of railroad bridge over the Illinois River at *Pekin, Ill.* The bolt is 1.16 feet S. of N. end and 2 feet E. of W. edge of coping. (Note 43, p. 129.)

T. B. M. 238.—Top of vertical foundation bolt, securing to its concrete foundation the SW. corner of the cast-iron electric block-signal post, which is situated first N. of the railroad river bridge at *Pekin, Ill.*, on the Peoria and Pekin Union R. R. The bolt is the one below the hinges of the large lower cast-iron door to base part of post.

T. B. M. 239.—Top of vertical foundation bolt securing to its concrete foundation the SW. corner of cast-iron electric block-signal post which is situated second N. of the railroad river bridge at *Pekin, Ill.*, on the Peoria and Pekin Union Ry. The bolt is the one below the hinges of the large lower cast-iron door to base part of post.

T. B. M. 240.—Top of vertical foundation bolt securing to its concrete foundation the cast-iron electric block-signal post third N. of the railroad river bridge at *Pekin, Ill.*, on the Peoria and Pekin Union Ry. The bench bolt is the one below the hinges of the larger lower cast-iron door to base part of post. This signal post is near the SW. corner of the old part of Lake Side Cemetery.

P. B. M. 50.—Stone, pipe, and cap (see note 41, p. 129), set in the highway between *Pekin and Wesley, Ill.*, about 0.75 mile northward from Lake Side Cemetery, where the highway turns from paralleling the Peoria and Pekin Union Ry., directly E., near the center of sec. 23, T. 25 N., R. 5 W., *Tazewell County, Ill.* The bench is 126 feet E., square out, from center of E. track of railroad, 48 feet E., square out, from the range of a row of telephone poles on the eastward side of highway to the southward of bench, and 60.6 feet S. from the range of a row of telephone poles on the S. side of highway to the E. of bench.

P. B. M. 51.—Stone, pipe, and cap (see note 41, p. 129), set in the front dooryard of Mrs. Elizabeth Walmsley's residence in *Wesley, Ill.*, which is situated between the Peoria and Pekin Union Ry. and the public highway leading through the village. The bench is 140 feet E. from edge of low water in Illinois River, 105.3 feet N. of the range of N. side of schoolhouse, 35.5 feet W. of the range of its E. or rear end, and 14.85 feet from the SW. corner of Mrs. Walmsley's house, being 5.2 feet S. and 14.3 feet W. of the ranges of the S. and W. sides of house, respectively.

T. B. M. 249.—Top of the southeasterly one of the four vertical bolts which secure to concrete foundation the plank to which are attached two bell-crank levers of block-signal apparatus operated from *Wesley Junction* interlocking tower of the Peoria and Pekin Union Ry. The bench is 357.4 feet southerly, measured along the track, from the range of the southerly side of tower, 51.4 feet northerly from center of iron interlocking post southerly of tower, and 5.5 feet, square out, westerly from center of W. main track. T. B. M. 249 is cut on the plank.

P. B. M. 52.—In top of coping stone at SW. end of SE. stone abutment of the Peoria and Pekin Union Ry. bridge over the Illinois River at *Peoria, Ill.* The bolt is 0.94 foot from SW. end, 2.62 feet from river side, and 2.6 feet from land side of coping stone, and is 0.58 foot from stone block resting on the coping and supporting the SW. bridge seat. (Note 43, p. 129.)

T. B. M. 250.—Highest point in square cut on top of coping stone at NE. end of NW. stone abutment of the Peoria and Pekin Union Ry. bridge over the Illinois River at *Peoria, Ill.* The bench is 0.43 foot back from the NE. edge, 2.85 feet from river side, and 2.43 feet from land side of coping stone. The square is surrounded by the letters U. S. B. M.

T. B. M. 251.—In center of top of stone post, 2.7 feet long by 0.95 foot square, projecting 1.25 feet above ground, situated on the SE. side of the room called the "tower" of distillery No. 11 (Great



Western Distillery), in *Peoria, Ill.* The bench is 30.1 feet NE. from the S. corner and 2.65 feet, square out, from river side of "tower" room. It is 130.3 feet SW. from center of large steel smokestack of the same works. (Note 42, p. 129.)

T. B. M. 253.—On top of the SW. end stone of top course of earth wall of NW. abutment of the Toledo, Peoria and Western Ry. bridge over the Illinois River at *Peoria, Ill.* The bench is 10.05 feet SW., square out, from center of track, 1.35 feet from end and 0.33 foot back from river face of stone on which it is. (Note 42, p. 129.)

B. M.—*Peoria, Peoria County, Ill.*; on the top of the southerly corner of the SW. end stone in the top course of the earth wall of the NW. abutment of the Toledo, Peoria and Western Ry. bridge over the Illinois River, being a square with the letters B. M. cut near it. This bench is said to be a railroad bench.

P. B. M. 53.—In top of the coping course of the NW. stone abutment of the Toledo, Peoria and Western Ry. bridge over the Illinois River at *Peoria, Ill.* The bench is on the second stone of coping SW. from the one directly supporting the NW. bridge seat of drawspan, 1.97 feet back from river edge of coping, 0.58 foot in front of river face of earth wall, and 5.15 feet from the SW. edge of iron bridge seat. (Note 43, p. 129.)

P. B. M. 54.—In top of stone doorstep of large double-door entrance on the NE. end of the Chicago, Rock Island and Pacific Ry. depot building in *Peoria, Ill.* The bench is directly in front of the stone column at NW. side of doorway, 0.4 foot back from front edge of step, 0.92 foot from its NW. end, and 4.3 feet from the NW. stone corner of depot. (Note 43, p. 129.)

T. B. M. 254.—In top of stone doorstep of the double doors on the NW. side of the Leisy Brewing Company's brick brewery on the NE. corner of Irving and North Water streets in *Peoria, Ill.* The door is 7.87 feet wide between brick jambs, opens on the alley, and is nearly opposite the office building. The bench is 0.26 foot back from front edge and 0.65 foot from NE. end of stone step, being 19.1 feet NE. from the NW. corner of building. (Note 42, p. 129.)

T. B. M. 256.—Center of cross cut on top of cast-iron doorstep of second door northeastward from the SW. corner of building No. 4 of the Kingman Plow Co.'s works in *Averyville (Peoria), Ill.*, which adjoins the SE. side and faces the Chicago, Rock Island and Pacific Ry. track. The cross is 65.4 feet northeastward, along the building, from its SW. corner, 49.8 feet SE., or square out, from the center of railroad track, 0.26 foot back from front edge of doorstep, and 0.27 foot from SW. face of doorway.

T. B. M. 257.—Near *Peoria, Peoria Co., Ill.*, on top of lowest stone step of S. or main entrance to Peoria Water Works' pumping station on the Illinois River, N. of the city. The bench is 1.05 feet back from front edge, and 1.48 feet E. of extreme W. end of step, 0.87 foot in front of second step, and 0.51 foot E. of E. edge of stone pier, supporting brick column at W. side of entrance. (Note 42, p. 129.)

P. B. M. 55.—Stone, pipe, and cap (see note 41, p. 129) set in the front yard of the Peoria Water Works' pumping station, *Peoria, Ill.* The bench is 174.7 feet southwestward from the SW. corner of pumping-station building, being 10 feet NW. from the range of its NW. side, and 174 feet SW. from the range of its SW. or front side. It is 50.4 feet SE., square out, from the center of the Chicago, Rock Island and Pacific Ry. track, or 0.75 foot SE. from right-of-way fence line, along which fence the bench is distant 76.65 feet from the N. fence of E. and W. highway in front of waterworks yard leading to the bridge, and 42.5 feet southwesterly from the center of a double wild-cherry tree standing near the fence. In sec. 26, T. 9 N., R. 8 E., *Peoria County, Ill.*

B. M. 1 P. (wye level).—Near *Peoria, Peoria Co., Ill.*, on the W. stone pier of the upper free wagon bridge over the Illinois River near the pumping station N. of the city, being a cross cut on the upstream end of the pier about 8 inches from N. edge and about 15 inches from E. edge of coping.

T. B. M. 258.—Near *Peoria, Peoria Co., Ill.*, at a point 6.14 feet E. of center of Chicago, Rock Island and Pacific Ry. track, and  $\frac{7}{8}$  mile N. from the Peoria Water Works' pumping station. It is 288.25 feet northward from signboard reading, "Siding at narrows  $\frac{1}{2}$  M." and 15.5 feet S. of switch block of siding into gravel pit, just S. of E. J. Singer's house on the bluff hillside. The rail projects 0.5 foot above ground, and is painted white. (Note 44, p. 130.)

P. B. M. 56.—Near *Peoria, Peoria Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the highway, adjacent to and paralleling the SW. side of the Chicago, Rock Island and Pacific Ry. at a point about 3.25 miles northward from the Peoria Water Works' pumping station. It is 110.4 feet SW., or square out, from the center of railroad track, 1.74 feet out from SW. fence line of highway, 87.4 feet NW. from center of wagon bridge over creek, and 89 feet westward from an elm tree, 1.8 feet in diameter, standing on the N. side of a creek. It is near the S. line of sec. 10, T. 9 N., R. 8 E., *Peoria Co., Ill.*, along lands of Anton Gauwitz.

P. B. M. 57.—Stone, pipe, and cap (see note 41, p. 129) set in the SW. corner of the school yard at *Mossville, Ill.*, at the N. end of the village, on the SW. corner of State and Grant streets. The bench is 2.7 feet N. and 2.5 feet E. of the S. and W. fences of school yard, respectively, 95.2 feet NW. from the NW. corner of A. Bauer's house, and 89.1 feet SW. from the SW. corner of old brick schoolhouse (burned and a new building erected in 1904). A 32-inch poplar tree stands 132.6 feet (center), about N. 80° E., and a 23-inch elm tree, 83.8 feet (center), about N. 35° E. from bench, both trees being in the school yard.

P. B. M. 58.—Stone, pipe, and cap (see note 41, p. 129) set in the highway leading from *Mossville* to *Rome, Ill.*, where the highway crosses from the W. to the E. side of the Chicago, Rock Island and Pacific Ry., about 2.5 miles NE. from *Mossville*. The bench is 58.15 feet from the intersection of wagon with railroad track, 3.65 feet SE. from NW. fence line of highway, 56.35 feet NW., or square out, from center of track, 65.5 feet NW. from center of S. cattle guard, and 91.45 feet W. from the center of N. cattle guard at this crossing.

P. B. M. 59.—Stone, pipe, and cap (see note 41, p. 129) set in the highway known as the "Farmington road," or as Knox street in *Rome, Ill.*, being the first road or street S. from Chicago, Rock Island and Pacific Ry. depot. The bench is 41.85 feet eastward, or square out, from center of railroad track, 194.5 feet southward from SE. corner of depot, 253 feet SW. from the SW. corner of S. Dahl's house, and about 2.5 feet N. from the S. hedge fence of Farmington road, in *Rome, Ill.*

P. B. M. 60.—Stone, pipe, and cap (see note 41, p. 129), set near the NW. corner of the public square in *Chillicothe, Ill.* It is 4.95 feet S. from northern fence of square, 28.94 feet SE. from the NW. corner post of fence surrounding square, 66.3 feet eastward, or square out, from center of main track of Chicago, Rock Island and Pacific Ry., and 104.5 feet SE. from the SE. corner of depot. A 28-inch soft-maple tree stands 21.8 feet (center) to the westward, a 20-inch soft maple, 19.7 feet (center) to the eastward, and a 12-inch elm, 55.2 feet (center) to the southward of bench; the first tree being near the NW. corner, and the second, one of a row along the northern side of the square.

T. B. M. 283.—At a point 6.16 feet E. of the center line of the Chicago, Rock Island and Pacific Ry. track; 105.6 feet northward, along the track, from signboard reading, "Chillicothe  $\frac{1}{2}$  M.;" and 15.2 feet southward from the switch block to wye track connecting the Rock Island with the Atchison, Topeka and Santa Fe Ry. in the SW. angle of the intersection of these roads, about 0.7 mile above *Chillicothe, Ill.* The rail projects 0.7 foot above ground and has two holes through web part. (Note 44, p. 130.)

P. B. M. 61.—In top of the fourth stone from the S. end in the upper course of the S. retaining wall of the E. abutment of the Atchison, Topeka and Santa Fe Ry. bridge over the Chicago, Rock Island and Pacific Ry. track, about 0.7 mile above *Chillicothe, Ill.* The bolt is in a niche cut in the front face of the stone, and is 16.45 feet southward, along the wall, from S. end of abutment proper. (Note 43, p. 129.)

P. B. M. 62.—Stone, pipe, and cap (see note 41, p. 129) set in the NE. corner of the front dooryard of Fred. Bennett's farmhouse on the westward side of the river road and of the Chicago, Rock Island and Pacific Ry. at the foot of the bluffs, about 4 miles NNE. from *Chillicothe, Ill.* The bench is 377 feet southward from the N. quarter post (stone) of sec. 3, T. 11 N., R. 9 E., *Peoria Co., Ill.*, which stone is on the Peoria-Marshall Co. line 54 feet W. from westward fence line of the river road; 74.55 feet westward, or square out, from the center of Chicago, Rock Island and Pacific Ry. track; 65.3 feet N. from a honey locust tree 2.2 feet in diameter; 32.2 feet southwestward from the center of a 22-inch black oak in road; 2.2 feet S. from northerly fence, and 2 feet W. from easterly or front fence of dooryard; and 48.2 feet NE. from the NE. corner of N. wing of Mr. Bennett's house, being 28.25 feet northward from the range of the northerly end of N. wing and 33.54 feet eastward from the range of the easterly or front side of main part of his house.

T. B. M. 291.—At a point 6.25 feet E. from the center of the Chicago, Rock Island and Pacific Ry. track, 112 feet N., along the track, from the center of pile bridge, No. 49, and 1.46 miles S. of *Sparland* station, being milepost 136. In sec. 23, T. 12 N., R. 9 E., *Marshall Co., Ill.* (Note 44, p. 130.)

P. B. M. 63.—Stone, pipe, and cap (see note 41, p. 129) set in the SE. corner of lot No. 14 of Cotton's first addition to *Sparland, Ill.*, at the NW. corner of the intersection of Railroad and Walnut streets. This lot is owned and occupied by Fred Vincent. The bench is 31.55 feet SE. from the SE. corner of his house, being 21.25 feet S. and 23.3 feet E. from said corner. It is 85 feet NW. from a soft maple tree, 1.4 feet in diameter, the middle one of three, 5.35 feet SE. from a catalpa tree in same corner of yard, 1.6 feet N. of N. fence of Walnut street, and 1.55 feet W. of W. fence of Railroad street.

T. B. M. 293.—Near *Sparland, Marshall Co., Ill.*, at a point 6 feet W. from the center of the Chicago, Rock Island and Pacific Ry., 31.4 feet northward along the track from the N. whistling post for highway, crossing first N. of Sparland and 0.54 mile northward from Sparland depot, being milepost 134. The rail projects 0.8 foot above ground, and the cross is a little to the W. of the middle of the base part of the end of the rail. (Note 44, p. 130.)

P. B. M. 64.—Stone, pipe, and cap (see note 41, p. 129) set on the right of way of the Chicago, Rock Island and Pacific Ry., 45 feet NW., or square out, from a point in the center line of track, 1 031 feet NE. along the track from milepost 131 (a piece of railway rail set vertically in the ground near track) being 5.45 feet from the NW. right-of-way fence line of railway or SE. fence line of highway. The bench is in the W.  $\frac{1}{2}$  SW.  $\frac{1}{4}$  sec. 30, T. 13 N., R. 10 E., Marshall Co., Ill., and about 3 miles SW. from *Henry, Ill.* It is Triangulation Station Crow Creek at SW. end of measured base.

T. B. M. 297.—At a point 6.08 feet SE., or square out, from the center of the Chicago, Rock Island and Pacific Ry. track, about 2.25 miles SW. from *Henry, Ill.*, being milepost 130. In the NW.  $\frac{1}{4}$  NE.  $\frac{1}{4}$  sec. 30, T. 13 N., R. 10 E., Marshall Co., Ill. (Note 44, p. 130.)

T. B. M. 299.—At a point 6.09 feet SE., or square out, from the center of the Chicago, Rock Island and Pacific Ry. track, being milepost 129. In sec. 20, T. 13 N., R. 10 E., Marshall Co., about 1.25 miles SW. from *Henry, Ill.* (Note 44, p. 130.)

P. B. M. 65.—Stone, pipe, and cap (see note 41, p. 129) set on the right of way of the Chicago, Rock Island and Pacific Ry., 45.6 feet NW., or square out, from a point in the center line of track, 1 003.8 feet SW., along the track, from milepost 128, and about  $\frac{1}{2}$  mile SW. from depot at *Henry, Ill.* It is 1 011.3 feet NE., along the track, from post reading, "Henry  $\frac{1}{2}$  M.," 4.5 feet SE. from the NW. right-of-way fence line, which separates railroad and highway. It is Triangulation Station Henry at NE. end of measured base.

T. B. M. 303.—At a point 6.15 feet E., or square out, from the center of the Chicago, Rock Island and Pacific Ry. track, and 80 feet N., along the track, from the center, as defined by fences, of the E. and W. highway along the south line of sec. 4, T. 13 N., R. 10 E., Marshall Co., Ill., being milepost 126. The rail projects 0.5 foot above ground and is about 1.5 miles N. of *Henry, Ill.* (Note 44, p. 130.)

T. B. M. 304.—Near *Henry, Marshall Co., Ill.*, at a point 6.16 feet NE., or square out, from the center of the Chicago, Rock Island and Pacific Ry. track and about 178 feet NW., along the track, from the center line, as defined by fences, of the highway along the E. line of sec. 5, T. 13 N., R. 10 E., Marshall Co., Ill., being milepost 125. The rail projects 0.3 foot above ground and is near the NE. corner of sec. 5, being 425 feet SE., along the track, from the Marshall-Putnam Co. line, as defined by fences of highway on this line. (Note 44, p. 130.)

P. B. M. 66.—Near *Putnam, Putnam Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the E. and W. highway on the Marshall-Putnam Co. line, 2.65 feet S. of N. fence line of highway, 45.6 feet SW., or square out, from the center of the Chicago, Rock Island and Pacific Ry. track, and 4.4 feet toward the track from the range of the SW. right-of-way fence line S. of the highway. It is 53.5 feet northwestward from railway post reading, "Marshall Co.-Putnam Co.," and 74.6 feet WNW. from post of danger warning sign at this crossing.

P. B. M. 67.—Stone, pipe, and cap (see note 41, p. 129) set in the SE. corner of the First M. E. Church yard in *Putnam, Ill.*, which church stands on the NE. corner of the intersection of highways at the center of sec. 19, T. 14 N., R. 10 E., Putnam Co., Ill. The bench is 131 feet SE. from the NE. corner of the church, and 149.8 feet eastward from the SW. corner of church, being 29 feet S. of the range of the S. or front end of church, and 108 feet E. of the range of the E. side. It is 5.45 feet N. of front fence, and 4.75 feet W. of E. fence of churchyard, and 20 feet W. from a soft maple tree, 1.9 feet in diameter, standing in the front dooryard of the parsonage.

P. B. M. 68.—Near *Putnam, Putnam Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the NE. corner of the front dooryard of William Anderson's farmhouse on the W. side of the highway along the foot of the bluffs, some 400 or 500 feet S. from Putnam-Bureau Co. line and in sec. 6, T. 14 N., R. 10 E., Putnam Co., Ill. The bench is 4 feet S. of N. fence and 4.85 feet W. of front fence of dooryard and 70 feet NE. from the NE. corner of house, being 40.85 feet N. of the N. end and 56.7 feet E. of the front side of house. A 30-inch elm stands 63.9 feet (center) S. about 40° E., a 30-inch elm, 69.3 feet (center) S. about 30° W., and a 19-inch burr oak 55.8 feet (center) SSE. from bench.

T. B. M. 314.—Near *Bureau, Bureau Co., Ill.*, at a point 6.16 feet E., or square out, from the center of the Chicago, Rock Island and Pacific Ry. track and just northward from the N. end of the curve in the track S. from the farmhouse occupied by John Mavity, being milepost 118. It is in the NE.  $\frac{1}{4}$  sec. 36, T. 15 N., R. 9 E., Bureau Co., Ill. The rail projects 0.4 foot above ground. (Note 44, p. 130.)

T. B. M. 317.—Near *Bureau, Bureau Co., Ill.*, at a point 6.15 feet E., or square out, from center of Chicago, Rock Island and Pacific Ry. track, 475.75 feet northward from switch block to siding, and about 155 feet southward from the first curve in track southward from the iron railroad bridge over Big Bureau Creek, being milepost 116. The rail projects 0.6 foot above ground. (Note 44, p. 130.)

P. B. M. 69.—Stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of the residence of D. B. George, in the SW. angle of the intersection of highways, at Bureau Valley Mill, on the SW. bank of Big Bureau Creek, about 1 mile SW. of *Bureau, Ill.* The bench is 139.25 feet southward from S. corner of mill, 228.35 feet southwestward from the SW. corner of Chicago, Rock Island and Pacific Ry. bridge over Big Bureau Creek; 185 feet NE. from a soft-maple tree, 1.6 feet in diameter, standing on the NW. side of the highway along the foot of the bluffs; 59.45 feet NW., or square out, from center of railroad track; 21.7 feet SW. from NE. fence and 8.5 feet NW. from SE. fence of dooryard, and 23.6 feet eastward from the E. corner of Mr. George's house, being 21.2 feet SE. from the range of the SE., or front side, and 10.55 feet NE. from the range of the NE. side of house. A 14-inch white pine tree stands 10.5 feet northeasterly and a 10-inch white pine tree 11.5 feet westerly from bench.

T. B. M. 319.—Center of cross cut in top of base of cast-iron bridge seat at SW. end of NW. plate girder of the Chicago, Rock Island and Pacific Ry. bridge, on the Peoria branch, over the Hennepin Canal, in the southern outskirts of *Bureau, Ill.* The cross is opposite the NE. one of two 2-inch bolt holes through the base of cast-iron bridge seat for bolts to secure the bridge seat to the masonry, which hole has no bolt in it. It is between the middle and the NE. vertical ribs on the NW. side of seat, being 0.5 foot from the NW. edge, and 5.1 inches from the NE. edge of base of casting.

T. B. M. 321.—On the top of a rock, NE. from *Bureau, Ill.*, on the Chicago, Rock Island and Pacific Ry. right of way. The square is 18.64 feet NW., or square out, from center of NW. track, and 348 feet southward, along the track, from railway post reading, "Station one mile." The stone presents an inclined flat face nearly toward the track, is about 1.5 feet thick by 4 feet broad, and projects about 1.7 feet on its NW., and about 3.2 feet on its SE. side above ground. (Note 42, p. 129.)

P. B. M. 70.—Stone, pipe, and cap (see note 41, p. 129) set on the right of way of the Chicago, Rock Island and Pacific Ry., 41.5 feet SE., or square out, from the center of the SE. track, or 1.3 feet in from the SE. right-of-way fence line, at a point 215 feet NE. along said fence, from the center of a farm gate, at farm crossing, on lands of Frank Rawson, whose farmhouse stands on the bluffs, approximately NW. from the bench. The bench is 0.877 mile NE. along the track from railway post reading, "Station one mile," or 1.877 miles from *Bureau station, Ill.* It is on a knoll of ground between railroad cut and marsh ground. The tracks curve more toward the E, 1 000 feet (estimated) to the NE. of the bench. In sec. 4, T. 15 N., R. 10 E., *Bureau Co., Ill.*

T. B. M. 324.—On top of N. end stone of first course above the bridge seat course of E. stone abutment of bridge No. 237 of the Chicago, Rock Island and Pacific Ry., about 0.5 mile to the westward of *Depue, Ill.* The bench is 7.6 feet N., or square out, from center of N. track, 1.02 feet from northerly edge and 1.5 feet from westerly face of stone on which it is. In the SE.  $\frac{1}{4}$  sec. 34, T. 16 N., R. 10 E., *Bureau Co., Ill.* (Note 42, p. 129.)

P. B. M. 71.—Stone, pipe, and cap (see note 41, p. 129), set on the right of way of the Indiana, Illinois and Iowa R. R., 98.2 feet W., or square out, from a point in the center line of the track, 234 feet northward, along the track, from the N. end of the plate-girder bridge over the Chicago, Rock Island and Pacific Ry. tracks. The bench is 1.6 feet E. from the westerly right-of-way fence line, and along this fence line it is 251.5 feet northward from the center of the N. track of the Chicago, Rock Island and Pacific Ry., and 400.3 feet southward from the S. fence line of E. and W. highway. In sec. 36, T. 16 N., R. 10 E., *Bureau Co., Ill.*, about 1.17 miles E. from *Depue*.

T. B. M. 328.—On W. stone of coping on S. side of E. abutment of the Chicago, Rock Island and Pacific Ry. bridge, No. 232, over Nigger Creek, about 0.54 mile W. of depot at *Marquette, Ill.* The bench is 5.94 feet S. of center of S. track, 1.1 feet from S. face, and 0.8 foot from W. face of coping stone. (Note 42, p. 129.)

B. M. (railroad), on SE. corner of S. coping of W. abutment of Chicago, Rock Island and Pacific Ry. bridge No. 232, over Nigger Creek, about 0.54 mile W. of depot at *Marquette, Bureau Co., Ill.*

T. B. M. 330.—On top of N. end stone of bridge seat course of W. stone abutment of bridge No. 227 of the Chicago, Rock Island and Pacific Ry., about 0.8 mile E. of *Marquette, Ill.* The bench is 0.85 foot from N. end and 0.75 foot from E. face of stone and 10.04 feet N. from center of N. track. (Note 42, p. 129.)

T. B. M. 332.—On top of stone, forming the first course above the bridge seat, at S. end of W. stone abutment of bridge No. 219 of the Chicago, Rock Island and Pacific Ry., about 1 mile W. of *Spring Valley, Ill.*, and about 500 feet E. of where the highway turns N. up the bluff hillside from paralleling the railroad. The bench is 10.35 feet S., or square out, from center of S. track, 0.65 foot from S. end and 0.92 foot from E. face of stone. It is 462 feet eastward from P. B. M. 72. In the SE.  $\frac{1}{4}$  sec. 33, T. 16 N., R. 11 E., *Bureau Co., Ill.* (Note 42, p. 129.)

P. B. M. 72.—Stone, pipe, and cap (see note 41, p. 129), set at the angle in the highway which follows the foot of the bluffs and parallels the Chicago, Rock Island and Pacific Ry. for about 2.3 miles E. from *Marquette, Ill.*, where it turns N. up the bluff hillside about 1.1 miles W. of *Spring Valley*. The bench is 42.95 feet N., or square out, from center of N. track of railroad, or 7 feet N. of fence between railway and highway; 90 feet E. of range of center line of culvert under wagon track; 7.85 feet W. of E. face of highway up the bluff hillside; 93.1 feet SE. from 16-inch black oak in highway; 62 feet southward from 18-inch elm on E. fence line of highway, and 60.5 feet E. from center of farm gate to farm track crossing. In the SE.  $\frac{1}{4}$  sec. 33, T. 16 N., R. 11 E., *Bureau Co., Ill.*

T. B. M. 333.—On top of stone next above bridge seat course at S. end of E. stone abutment of bridge No. 217 of the Chicago, Rock Island and Pacific Ry., about 0.58 mile W. of the Rock Island depot at *Spring Valley*. The bench is 7.15 feet S. from center of S. track, 0.46 foot from S. end, 0.7 foot from W. face of stone. In sec. 3, T. 15 N., R. 11 E., *Bureau Co., Ill.* (Note 42, p. 129.)

P. B. M. 73.—In the top of the fourth stone below the top of the S. parapet wall of the stones forming the steps of the S. wing wall at the E. end of the double-arch stone bridge over Spring Creek, on the Chicago, Rock Island and Pacific Ry., in *Spring Valley, Ill.* The bolt is 11.77 feet S., or square out, from the center of S. track, 0.94 foot from the SE. end of step, and 0.63 foot from SW. face of wing wall. (Note 43, p. 129.)

Sanitary B. M.—*Spring Valley, Bureau Co., Ill.*, on westerly corner of the W. coping stone of the N. parapet wall of the double-arch stone bridge of the Chicago, Rock Island and Pacific Ry. over Spring Creek. The letters S. D. B. M. are cut near the bench.

T. B. M. 335.—On the top of N. stone of second course down from the top of the E. abutment of a small bridge of the Chicago, Rock Island and Pacific Ry., which was converted in 1898 into a concrete culvert within the span of the original bridge. The bench is 748 feet E. of railroad post reading "*Spring Valley  $\frac{1}{2}$  M.*," 215 feet W. of milepost 103, and about 1.25 miles E. of the Rock Island depot in *Spring Valley, Ill.*, and about 0.6 mile W. along the track from Bureau-Lasalle county line. It is 11.55 feet N. from center of N. track, 0.6 foot from N. end, and 0.53 foot from W. face of stone. (Note 42, p. 129.)

P. B. M. 74.—Near *Spring Valley, Bureau Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set on the Chicago, Rock Island and Pacific Ry. right of way, 62.15 feet S. from center of N. track, 1.5 feet N. from S. right-of-way fence line, 91.2 feet southwesterly from T. B. M. 335, or 55.1 feet W. along the track from it, and 274 feet southwesterly from milepost 103. In the NW.  $\frac{1}{4}$  sec. 1, T. 15 N., R. 11 E., *Bureau Co., Ill.*

T. B. M. 336.—Near *Peru, Lasalle Co., Ill.*; highest point in a square cut on top of stone, first above bridge seat course, on N. end of E. stone abutment of bridge No. 201 of Chicago, Rock Island and Pacific Ry., about 0.13 mile eastward from Bureau-Lasalle county line. The bench is 8.07 feet N. from center of N. track, 1.17 feet from N. end, and 1 foot from W. face of stone.

T. B. M. 337.—On top of coping of parapet wall at the N. side of stone arch bridge of the Chicago, Rock Island and Pacific Ry., situated 2 344 feet W., along the track, from the crossing of said R. R. with the Chicago, Burlington and Quincy R. R. in the western part of *Peru, Ill.* The bench is 10.64 feet N. of the center of N. track, 0.82 foot E. of W. end, and 0.7 foot S. of N. face of coping. (Note 42, p. 129.)

T. B. M. 338.—On top of W. coping stone of N. parapet wall of small stone culvert of the Chicago, Rock Island and Pacific Ry., situated about 350 feet E. of the interlocking tower at the crossing of said R. R. with the Chicago, Burlington and Quincy R. R. in the western part of *Peru, Ill.* The bench is 346.95 feet eastward from the SE. corner of tower, 12.55 feet N. from center of N. track, 1.2 feet from W. end, and 0.91 foot from N. face of coping. The number 156, in large figures, is cut near the center of top of coping. (Note 42, p. 129.)

P. B. M. 75.—In top of bridge seat course of pier at N. end of draw span of highway bridge over the Illinois River at foot of Marion street in *Peru, Ill.* The bolt is 1.3 feet from N. face and 1.25 feet from W. end of pier. (Note 43, p. 129.)

Sanitary B. M.—*Peru, Lasalle Co., Ill.*, on top of NW. stone of bridge seat course in pier at N. end of draw span of wagon bridge over the Illinois River at foot of Marion street, being the highest point in a circle on the NW. corner of the pier, 1.49 feet northwesterly from P. B. M. 75. The letters S. D. B. M. are cut near the bench.

B. M. 70 A (Seddon).—A cross within a square cut on the top of the S. wall of Lock No. 15 of the Illinois and Michigan Canal at *Lasalle, Ill.*, on the second stone W. from the S. lower gate, 6.1 feet westward from center of quoin post, 0.5 foot back from face of lock wall, and 0.46 foot eastward from the half-foot jog in wall. In the absence of any letters near this bench, or definite description of the Seddon bench on this lock, there is some uncertainty about this being 70 A. Designated as B. M. 1 on Lock No. 15 in field notes and computations.

B. M. 38 of 1883.—Highest point in a circle cut on top of the wall, at right angles to lock wall, at lower end of S. tail wall of Lock No. 15 of the Illinois and Michigan Canal in *Lasalle, Ill.* The circle is on the largest one of the coping stones on this part of the wall, there being 2 coping stones to the S. and 2 to the N. of it—all to the S. of the curved lower end of tail wall. The circle is 23.77 feet SW. from the center of quoin post of S. lower gate, 0.38 foot back from face of wall, and 3 feet from southerly edge of stone on which it is. It is a very indistinct mark with no letters near it, but reputed to be an old bench. Designated as B. M. 2 on Lock No. 15 in field notes and computations. It is "on the second square stone from the curve in the left tail wall."

P. B. M. 76.—In top of N. granite stone bridge seat on the W. pier of the Chicago, Burlington and Quincy R. R. bridge over the Illinois and Michigan Canal, between Locks 14 and 15, in *Lasalle, Ill.* The bolt is 0.96 foot from N. edge of stone, midway between E. and W. edges, and 0.62 foot N. from N. edge of iron bridge seat. (Note 43, p. 129.)

T. B. M. 340.—On top of coping of N. end of the second pier from the E. end of the aqueduct bridge carrying the Illinois and Michigan Canal over Little Vermilion Creek, in the eastern part of *Lasalle, Ill.*, a few hundred feet to the E. of the Illinois Central R. R. bridge. The bench is near the center of the SE. one of the 5 coping stones on this end of the pier, being 1.56 feet from the E. edge and 2.2 feet from the S. edge of this stone. (Note 42, p. 129.)

Sanitary B. M.—*Lasalle, Lasalle Co., Ill.*, on top of the SE. corner of the coping stone at the rounded southerly end of E. stone abutment of aqueduct bridge carrying the Illinois and Michigan Canal over Little Vermilion Creek, being highest point in a square. The letters S. D. B. M. are cut near the bench.

P. B. M. 77.—In top of stone forming the bridge seat at base of column at N. end of E. girder of the Illinois Central R. R. bridge over the Chicago, Rock Island and Pacific Ry. and the Illinois and Michigan Canal in *Lasalle, Ill.* This pier of the bridge is between the street and the Chicago, Rock Island and Pacific Ry. tracks. The bolt is 1.52 feet from E. edge and 1.46 feet from N. edge of stone in which it is, and 1.52 feet N. from N. edge and 0.59 foot W. from range of E. edge of cast-iron bridge seat at base of column. (Note 43, p. 129.)

T. B. M. 343.—Near *Lasalle, Lasalle Co., Ill.*, on the top of a granite boulder marking, it is said, the SE. corner of sec. 13, T. 33 N., R. 1 E., *Lasalle Co., Ill.* This stone is flat on the top, dark in color, and about 2 feet square, except for a deficiency on the S. side, where a small portion is white. There are a number of other but smaller stones around this stone. The bench is 0.55 foot W. from E. edge and 1.2 feet S. from N. edge of stone and 6 feet N. from center of wagon track of E. and W. river road, which at the stone turns NE. for a short distance and then continues its general direction. (Note 42, p. 129.)

P. B. M. 78.—Stone, pipe, and cap (see note 41, p. 129), set near the junction of the river road, between *Lasalle* and *Utica* bridge, with a road running from it, first N., then E., etc., to *Utica, Ill.* This road junction is in the SE.  $\frac{1}{4}$  sec. 18, T. 33 N., R. 2 E., *Lasalle Co.*, and 1.3 miles W. from *Utica* bridge, over the Illinois River. The bench is 2.33 feet W. from E. fence of N. and S. road, along which fence it is 66.7 feet N. from center of wagon track of river road, 61.5 feet N. from junction of said fence, with N. fence line of river road, and 16.5 feet N. from a small box elder.

T. B. M. 347.—On the top of the NE. end stone of the eleventh or lowest stepped course below the bridge seat (this course being the fourth course up from the ground) of the E. wing wall of the N. stone abutment of the *Utica* bridge over the Illinois River, about 1 mile S. of *Utica, Ill.* The bench is 0.59 foot from NE. end of stone and 0.72 foot from its SE. face. (Note 42, p. 129.)

B. M. 69 (Seddon).—1 mile S. of *Utica, Ill.*, 0.85 foot from T. B. M. 347 and on the same stone. The letters B. M. are cut below it on the vertical drafted edge of the stone. Same as U. S. B. M. No. 36 of 1883.

U. S. B. M.—The center of a circle cut on the E. stone of the bridge-seat course of the N. abutment of the Utica bridge over the Illinois River, about 1 mile S. of *Utica, LaSalle Co., Ill.* The circle is near the E. corner of the stone, and the letters U. S. are cut near it.

P. B. M. 79.—In top of the SW. one of the 3 coping stones on the E. end of the first stone pier S. of the N. stone abutment of the Utica bridge over the Illinois River, about 1 mile S. of *Utica, Ill.* The bolt is 2.02 feet N. of S. face of stone, 1.39 feet E. of E. edge of the stone forming the NE. bridge seat for the second span from N. end of bridge, and 5.27 feet southwestward from the upper cut-water edge of the pier. (Note 43, p. 129.)

T. B. M. 348.—On the top of the N. parapet wall of a small stone arch bridge on the river road 0.64 mile E. of the Utica bridge over the Illinois River. The bench is 1.2 feet S. of N. face of wall and 1.4 feet E. of a point vertically over the center of the keystone of the arch. In sec. 16, T. 33 N., R. 2 E., *LaSalle Co., Ill.* There is another small stone bridge on this road about 300 feet to the westward of this bridge. (Note 42, p. 129.)

T. B. M. 349.—On the top of NE. end stone of NE. wing wall of small stone arch bridge on the river road, being the third bridge eastward from the Utica bridge over the Illinois River. The bench is 0.47 foot from NE. end of wing wall, 0.3 foot from its NW. face, 9.75 feet NE. from center of N. keystone of arch, and 5.8 feet N. from the range of the N. face of N. parapet wall. In sec. 15, T. 33 N., R. 2 E., *LaSalle Co., Ill.* (Note 42, p. 129.)

P. B. M. 80.—Stone, pipe, and cap (see note 41, p. 129), set in the NE. corner of the front dooryard of Henry Zimmermann's large stone house, formerly known as Sulphur Spring House, situated on the S. side of the river road, about 2.5 miles E. of the Utica bridge over the Illinois River. The bench is 1.96 feet W. of E. fence of dooryard, 4.33 feet S. of S. fence of road E. of field E. of dooryard, and 134.8 feet NE. from NE. corner of stone house, being 112.6 feet N. and 73.3 feet E. from said corner. It is 35 feet northwestward from a 36-inch cottonwood, 11.15 feet eastward from a 10-inch locust, and 94.5 feet northeastward from a 42-inch cottonwood in yard. In sec. 23, T. 33 N., R. 2 E., *LaSalle Co., Ill.*

P. B. M. 81.—Near *Ottawa, LaSalle Co., Ill.*; top of copper bolt leaded vertically into the top of the W. beveled end stone of the sixth course, above the towpath, of the S. abutment of the wagon bridge over the Illinois and Michigan Canal N. of D. M. Farson's orphan home, on the Buffalo Rock farm, about  $\frac{1}{2}$  mile W. from *LaSalle Co.* poorhouse. The bench is 0.4 foot from N. face of abutment, 0.43 foot W. of W. end of stone in next course above, and 0.36 foot E. from top edge of beveled face of stone in which it is. In sec. 17, T. 33 N., R. 3 E., *LaSalle Co.*

P. B. M. 82.—Near *Ottawa, LaSalle Co., Ill.*; stone, pipe, and cap (see note 41, p. 129), set in the NE. corner of the field which adjoins, on the W., the private driveway along the W. side of the front yard of the *LaSalle Co.* poorhouse. The bench is 2.3 feet S. of S. fence line of river road, 1.7 feet W. from W. fence of private drive, 89.2 feet S. from center line of electric railway, 27.15 feet W. from center of 16-inch soft maple at NW. corner of front yard of poorhouse, and 40.8 feet NW. from the center of the third tree S. from the N. end of the row of shade trees along the W. side of said poorhouse yard. In the SE.  $\frac{1}{4}$  sec. 17, T. 33 N., R. 3 E., *LaSalle Co., Ill.*

T. B. M. 357.—Highest point in a square cut into an outcropping of sandstone rock, on a level with the ground surface, in the river road in the Western outskirts of *Ottawa, Ill.*, and here known as *Ottawa avenue*. The bench is about 0.53 mile NE. of an angle in the river road; 56.47 feet SE., square out, from center of street car track; 39.5 feet SE. from center of wagon track; 165.87 feet NE. from the NE. corner of a lone house, S. of road, belonging to the Development Assn.; and 138.6 feet NE. of the range of the NE. side, and 89.25 feet NW. of the NW. or front side of the house. In the NW.  $\frac{1}{4}$  sec. 15, T. 33 N., R. 3 E., *LaSalle Co.*

B. M. 64 (Seddon).—Highest point in a circle cut on the top of the coping stone at the E. end of the first pier S. of the N. abutment of the Chicago, Burlington and Quincy R. R. bridge over the Illinois River at *Ottawa, Ill.* The circle is 8 inches W. of the cut water angle of coping. Marked with the letters U S, above which is the circle.

P. B. M. 83.—In top of coping on E. end of N. stone abutment of the Chicago, Burlington and Quincy R. R. bridge over the Illinois River at *Ottawa, Ill.* The bolt is 2.57 feet from NE. corner, 4.66 feet from upstream angle, and 5.84 feet from SE. corner of coping. It is 5.63 feet E. from E. face of E. granite bridge seat of plate girder span of this bridge. (Note 43, p. 129.)

B. M. 63 (Seddon).—Highest point in a sector cut on the top of the SE. corner of coping stone at E. end of N. abutment of highway bridge over the Illinois River at *Ottawa, Ill.* The bench is on the first course of stone below the bridge seat stone. "Same as B. M. 87, Sanitary." The letters S. D. B. M. are cut near the bench.

T. B. M. 361.—On the top of the stone curbing on the W. side of Lasalle street, at a point between the E. end of the Hydraulic Basin and the old City (flour) Mills, in *Ottawa, Ill.* It is 51.95 feet NW. from the SW. corner of S. wing, and 77.2 feet SW. from the NW. corner of N. wing of mill, and 28.05 feet N. from the center of the Chicago, Burlington and Quincy R. R. siding track along S. side of basin. (Note 42, p. 129.)

P. B. M. 84.—In top of coping stone on S. end of W. stone abutment of Main Street bridge over Fox River, in *Ottawa, Ill.* The bolt is 0.8 foot from S. end of coping, 0.85 foot from its E. edge, and 0.97 foot S. of S. face of bridge seat stone. (Note 43, p. 129.)

T. B. M. 363.—On the top of the E. end stone of the second course up from the ground, in the E. wing wall of the S. abutment of the highway bridge over the Illinois and Michigan Canal, about 1.65 miles E. of the center of *Ottawa, Ill.* The bench is 1.33 feet from N. face of wing wall, 0.89 foot from E. end of stone. (Note 42, p. 129.)

B. M. 62 (Seddon).—Near *Ottawa, Lasalle Co., Ill.*, on same bridge as T. B. M. 363; highest point in a circle cut on the top of the E. end stone of the fourth course above the water in the E. wing wall of the N. abutment. The circle is near the SE. corner of the step. The letters U. S. are cut near the circle.

T. B. M. 366.—On the top of the coping of the S. parapet wall of the small stone arch culvert under the Illinois and Michigan Canal first E. of the highway bridge over the canal, the bridge being about 1.65 miles E. of the center of *Ottawa, Ill.*, and the culvert about 1.67 miles E. from the bridge. The bench is 0.31 foot W. from vertically over the center of keystone of arch and 1.18 feet N. from the S. edge of coping. It is about 0.68 mile W. from schoolhouse (district No. 152), and near the W. line of sec. 9, T. 33 N., R. 4 E., *Lasalle Co.* (Note 42, p. 129.)

P. B. M. 85.—Stone, pipe, and cap (see note 41, p. 129) set on the S. fence line of the highway which parallels and adjoins on the S. the Illinois and Michigan Canal between *Ottawa* and *Marseilles, Ill.*, at a point 65.6 feet E. of the E. side of schoolhouse (district No. 152), and 8.2 feet S. of the range of the N. or front end of schoolhouse. The bench is also 74.7 feet S. of the S. water edge of canal, 37 feet S. of the center of wagon track, and 40.75 feet N. of the center line of the electric ry. track. In sec. 9, T. 33 N., R. 4 E., *Lasalle Co.*, about 3.84 miles eastward from Main Street bridge over Fox River in *Ottawa, Ill.*

T. B. M. 371.—On the top of the stone wall along the N. side of the Illinois and Michigan Canal, under and extending a short distance to the east of Elevator A, which stands about 29.5 feet to the W. of the W. line of Main street in *Marseilles, Ill.* The bench is on the first stone of the wall to the E. of the SE. corner of the elevator, 2.03 feet from E. side of elevator, and 1.03 feet back from face of wall. (Note 42, p. 129.)

P. B. M. 86.—In top of NE. end stone of the eighth course, below the bridge seat stone, in the E. wing wall of the N. abutment of the highway bridge over the Illinois River at *Marseilles, Ill.* The bolt is 1.86 feet from NE. end of stone and 0.95 foot back from SE. face of wing wall. (Note 43, p. 129.)

B. M. 59 (Seddon).—*Marseilles, Lasalle Co., Ill.*, on same bridge and abutment as P. B. M. 86; highest point in a circle cut near the SW. corner of the W. bridge seat stone. "Same as B. M. 103, Sanitary." The letters S. D. B. M. are cut near the bench.

P. B. M. 87.—In the top of the S. wall of lock No. 10 of the Illinois and Michigan Canal in *Marseilles, Ill.* The bench is on the first stone W. of the quoin post of the S. lower gate. The bolt is 1.96 feet S. of N. face of stone, 1.56 feet N. of S. edge of stone, and 9.5 feet W. of center of quoin post of gate. (Note 43, p. 129.)

B. M. (E. J. Ward, 1902).—*Marseilles, Lasalle Co., Ill.*, on S. wall of Lock No. 9 of the Illinois and Michigan Canal, being highest point in a circle just above recess for upper S. gate. Marked B. M.

P. B. M. 88.—Stone, pipe, and cap (see note 41, p. 129), set on the S. embankment of the Illinois and Michigan Canal, and in a driveway from the towpath to a hay barn on the farm of E. H. Spicer. The bench is 18 feet S. of water edge of canal, 145.2 feet N. from the NW. corner of barn, 1.25 feet W. of the range of W. end of barn, and about 554 feet W., along the towpath, from the center of the stone culvert under the canal and over Kickapoo Creek. It is 2.9 miles eastward, along the canal, from Main street, in *Marseilles, Ill.*

B. M. 10 (E. J. Ward, 1899).—A cross cut on top of coping of S. parapet wall (curved) of stone culvert over Kickapoo Creek and under the Illinois and Michigan Canal, about 3 miles eastward along the towpath, from Maine street, *Marseilles, Lasalle Co., Ill.* The cross is near the SW. corner of coping, being 0.4 foot back from SE. face and 0.38 foot from SW. end of coping.



T. B. M. 378.—On top of coping of N. parapet wall of stone arch culvert under the Illinois and Michigan Canal, about  $\frac{1}{2}$  mile W. of *Seneca, Ill.* The bench is on the W. stone of coping, 0.7 foot from its N. face and 3.36 feet from its W. end. (Note 42, p. 129.)

B. M. 15 (E. J. Ward, 1899).—Highest point in a sector cut on NW. corner of W. coping stone of S. parapet wall of stone culvert under the Illinois and Michigan Canal, about  $\frac{1}{2}$  mile W. from *Seneca, LaSalle Co., Ill.* Marked B. M.

T. B. M. 380.—Top of the SW. one (the one nearer the track) of the two  $\frac{3}{4}$ -inch rods projecting 4 inches vertically upward from the top of the SE. one of the two low concrete posts set on the NE. side of the Seneca and Kankakee R. R., near milepost 1, for supporting extra rails. This bench bolt is 11.1 feet NE. or square out from center of track, 19.4 feet southwesterly from center of milepost 1, and 71 feet N. of center of wagon track of E. and W. highway on S line of sec. 24, T. 33 N., R. 5 E., *LaSalle Co., Ill.*, near the LaSalle-Grundy County line, 1 mile east of *Seneca, Ill.*

P. B. M. 89.—Stone, pipe, and cap (see note 41, p. 129), set on the right of way of the Seneca and Kankakee R. R., near its intersection with the river road, here running along the S. line of sec. 24, T. 33 N., R. 5 E., *LaSalle Co., Ill.* The bench is 47.57 feet NE. or square out from center of R. R. track, 2.5 feet from NE. right-of-way fence line, 123.17 feet southeasterly from center of milepost 1, 117.75 feet southeasterly from T. B. M. 380, 20.15 feet northeasterly from post of "Railroad crossing" sign, 84.2 feet NW. from osage orange tree, and nearly in line of the N. fence of river road.

P. B. M. 90.—Stone, pipe, and cap (see note 41, p. 129), set in the front dooryard of William Hollenbeck's farmhouse (Barry farm), on the N. side of the river road between *Seneca* and *Morris, Ill.*, about 3.6 miles ENE. from Seneca, in the SE.  $\frac{1}{4}$  sec. 16, T. 33 N., R. 6 E. The bench is 52 feet southward from the SW. corner of house, being 45.75 feet WSW. and 24.2 feet SSE. from the ranges of the WSW. and SSE. sides of the house, respectively. It is 56.4 feet southward from an elm tree (diameter 1.4 feet), 6.35 feet southward from 1-inch box elder, and 2.2 feet from northward fence line of river road. The excavation for this bench was almost entirely through soft sandstone rock.

P. B. M. 91.—Stone, pipe, and cap (see note 41, p. 129), set in the river road, which parallels and adjoins the N. side of the Illinois and Michigan Canal between "5-mile bridge" and *Morris, Ill.*, 2.45 feet from N. fence line of road, at field gate, and in line with the first N. and S. field fence W. from the E. line of sec. 12, T. 33 N., R. 6 E., Grundy Co., from which line it is distant, along the river road, about 0.29 mile SW. It is about 113 feet from water edge of canal, about 300 feet southwestward from an angle in the river road NW. of the lower end of Waupecan or Sugar Island, and about opposite the middle of a curve in the canal; in the SE. quarter of section 12.

T. B. M. 394.—Center of a circle cut on the S. corner of the S. stone of the top course of the E. abutment of the aqueduct bridge, carrying the Illinois and Michigan Canal over Nettle Creek in the W. part of *Morris, Ill.* Same as U. S. B. M. 46 (Seddon), 1899. Marked U. S.

T. B. M. 395.—Highest point in a square cut in a niche on the inclined face of the lowest coping stone of the W. wing wall of the S. abutment of the highway bridge over the Illinois and Michigan Canal on the street in *Morris, Ill.*, leading to and across the Illinois River bridge. The bench is 0.4 foot from N. edge and 0.6 foot up from lower end of coping stone. It is marked U. S. above the square.

P. B. M. 92.—In top of the NE. end stone of the seventh course down from the top of the E. wing wall of the N. abutment of the highway bridge over the Illinois River at *Morris, Ill.* The bench is 0.43 foot back from the face of the wing wall and 0.46 foot from the NE. end of this course of stone. (Note 43, p. 129.)

B. M. 45 A (Seddon).—*Morris, Grundy Co., Ill.*, on the same bridge, abutment, and wall as P. B. M. 92; highest point in a square cut on the top of the NE. corner of the upper course of stone (consisting of two stones). The bench is 5.85 feet E. of the range of the E. face of E. truss of bridge. "Same as B. M. 90, Sanitary." Marked B. M.

B. M. 45 B (Seddon).—*Morris, Grundy Co., Ill.*, on the same bridge and abutment as P. B. M. 92; highest point in a circle cut on the top of a projection on the S. face of the second stone from the E. corner in the lowest visible course. The bench is 6 feet from E. corner of abutment and about 2 inches above ground. "Same as U. S. B. M. No. 21 of 1883." The letters B. M. are cut above the bench on the next higher course.

T. B. M. 398.—On top of foundation stone to N. iron gatepost of W. carriage entrance to Evergreen Cemetery, on the river road, about 1.5 miles NE. of *Morris, Ill.* The bench is 1.03 feet W. of W. side of base of iron post of gateway, and 0.52 foot N. of the range of the S. side of base of post, in the NW.  $\frac{1}{4}$  sec. 2, T. 33 N., R. 7 E., Grundy Co. (Note 42, p. 129.)

T. B. M. 400.—On the top of a granite boulder, triangular in plan and bluntly wedge shaped in elevation, whose sides are about 4.8 feet, 5.3 feet, and 5.8 feet, respectively, at surface of ground, and whose height is about 2.25 feet above ground. It is situated on a knoll in a field on the SE. side of the river road, 33 feet from SE. fence line of road, 61 feet from center of wagon track, 131.9 feet S. of P. B. M. 93, nearly opposite the farmhouse of Thomas Hutchings, on whose land it is, and 63 feet SW., or square out, from the SW. fence line of his private driveway; in the SE.  $\frac{1}{4}$  sec. 36, T. 34 N., R. 7 E., Grundy Co., Ill., about 3.1 miles NE. from Morris. (Note 42, p. 129.)

P. B. M. 93.—Stone, pipe, and cap (see note 41, p. 129) set in the S. corner of a small field on the NW. side of the river road, and on the NE. side of the private driveway leading from the river road to the farm buildings of Thomas Hutchings, about 3.1 miles NE. from Morris, Ill. The bench is 2.65 feet from NW. road fence, 3.8 feet from NE. fence of driveway, 344.5 feet SE. from the SE. corner of Thomas Hutchings's house, and 290.2 feet S. from the S. corner of George Hutchings's house. It is between the Illinois River and the Illinois and Michigan Canal, and in the SE.  $\frac{1}{4}$  sec. 36, T. 34 N., R. 7 E., Grundy Co.

T. B. M. 402.—Near Morris, Grundy Co., Ill., on the NW. corner of the top stone of the NW. wing wall of the NE. abutment of a small iron highway bridge on the river road, about 0.96 mile SW. from Lock No. 8 of the Illinois and Michigan Canal at Aux Sable Creek. The bench is 308.5 feet SW., along the road, from the range of the SW. side of Richard Sharp's farmhouse, 0.17 foot from N. end of stone, 0.23 foot back from face of wing wall, and 10.43 feet out from center line of bridge. (Note 42, p. 129.)

P. B. M. 94.—In top of coping of S. wall of Lock No. 8 of the Illinois and Michigan Canal at Aux Sable Creek, about 6 miles NE. of Morris, Ill. The bench is on the second coping stone below the lower gates, 1.57 feet back from the N. face of coping, 10.1 feet westward from center of quoin post of lower S. gate, 3.8 feet from E. end, and 3.65 feet from W. end of the stone in which it is, and 37.05 feet NW. from P. B. M. 95. (Note 43, p. 129.)

B. M. 39 (Seddon).—Near Morris, Grundy Co., Ill.; highest point in a circle cut on the top of the S. wall of Lock No. 8 of the Illinois and Michigan Canal at Aux Sable Creek. It is on the coping stone first E. of the recess for lower S. gate, 0.3 foot E. of upper end of recess, and 1.33 feet back from S. face of lock chamber; in sec. 29, T. 34 N., R. 8 E., Grundy Co., Ill. Marked U S.

P. B. M. 95.—Near Morris, Grundy Co., Ill.; stone, pipe, and cap (see note 41, p. 129) set in the yard of the house of the keeper of Lock No. 8 of the Illinois and Michigan Canal, at Aux Sable Creek, Grundy Co., Ill. The bench is nearly opposite the lower gates of the lock, being 36.75 feet southward from the center of quoin post of S. lower gate. It is 15.7 feet southwesterly from the NW. corner and 18.9 feet northwesterly from the SW. corner of the keeper's house. It is 10.5 feet E. of a 20-inch box elder tree, 8.8 feet S. of a 16-inch box elder, and 16.2 feet SW. from a second 16-inch box elder.

T. B. M. 404.—Near Morris, Grundy Co., Ill.; highest point in a square cut on the top of the N. wing wall of the E. abutment of a small bridge on the river road, over a creek, about 0.67 mile E. of Lock No. 8 of the Illinois and Michigan Canal at Aux Sable Creek. The bench is 11.3 feet E. of middle of bridge, and 8.3 feet N. of its center line. There is a stone arch culvert under the Illinois and Michigan Canal, to the NE. of the road bridge, over the same creek; in sec. 28, T. 34 N., R. 8 E., Grundy Co., Ill. The letters U S are cut near the square.

T. B. M. 405.—Near Channahon, Will Co., Ill.; highest point in a square cut on the highest point of a granite boulder, about 3 feet long by 2.7 feet wide by 1.5 feet above ground, lying near the N. side of the river road, at a point 1.28 miles ENE., along the river road, from Lock No. 8 of the Illinois and Michigan Canal at Aux Sable Creek, about  $\frac{1}{4}$  mile WSW. from a marked angle in the river road, and about  $\frac{1}{2}$  mile W. of the Elgin, Joliet and Eastern R. R. The stone lies 3.3 feet S. of the N. road fence, 15 feet northward from center of wagon track, and 2 feet W. of fence on the E. line of sec. 28, T. 34 N., R. 8 E., Grundy Co., Ill. The square is near the southwestward end of the top of the stone which has a conchoidal depression in it to the SE. of the bench. It is marked U S, the letters being to the SE. of the square.

B. M. 38 A (Seddon).—Near Channahon, Will Co., Ill.; highest point in a circle cut on the top of the coping of the S. abutment of the Elgin, Joliet and Eastern R. R. bridge over the Illinois and Michigan Canal, about 1.96 miles ENE. from Lock No. 8 at Aux Sable Creek. The circle is near the NE. corner of coping, being 0.54 foot back from the N. and E. edges of the coping, respectively, at corner of bevel; in sec. 22, T. 34 N., R. 8 E., Grundy Co., Ill. Marked U S.

P. B. M. 96.—Stone, pipe, and cap (see note 41, p. 129) set in the SW. corner of Dresden Catholic Cemetery in the NE.  $\frac{1}{4}$  sec. 26, T. 34 N., R. 8 E., Grundy Co., Ill., and on the N. side of the river road between the Aux Sable lock, No. 8, of the Illinois and Michigan Canal and *Channahon, Ill.* The bench is about 3 miles E. of the Aux Sable lock, about 3 miles SW. of Channahon, and about 0.25 mile E. of Jacob Hansel's farmhouse. It is 2.5 feet E. of W. fence of cemetery, 2.1 feet N. of the front fence of cemetery, 10.6 feet N. of the range of the N. fence line of river road to the W. of cemetery, 22.6 feet SE. of an 8-inch box elder tree, and 79.85 feet W. of an 11-inch box elder.

P. B. M. 97.—In top of coping of E. wall of Lock No. 7 of the Illinois and Michigan Canal, which is the lower lock at *Channahon, Ill.* The bench is near the center of the top of the coping stone, first S. of the quoin coping stone at the E. lower gate. The bolt is 2.44 feet back from the face of the E. wall, 2.3 feet N. of S. end of stone, and 5.93 feet southward from center of E. lower gate quoin post. (Note 43, p. 129.)

B. M.—*Channahon, Will Co., Ill.*, on E. wall of Lock No. 7 of the Illinois and Michigan Canal, being cross cut on the top of an iron bolt leaded vertically into the top of the quoin coping stone of the E. upper gate. The bolt is 0.75 foot N. from S. end of stone, 3.21 feet back from face of lock chamber, and 3.48 feet SE. from wooden quoin post of gate. The letters B. M. are cut near and to the SW. of bolt.

P. B. M. 98.—Stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of Patrick Briscoe's farmhouse, which is about  $\frac{1}{4}$  mile E. of *Channahon, Ill.*, on the road to Smiths Bridge over the Des Plaines River. The bench is 47.9 feet NNE. of the NE. corner of house, 50.55 feet northwestward from a 26-inch hackberry tree, 13.4 feet S. of a 23-inch elm, 25.3 feet SE. of a 26-inch elm, 2.55 feet W. of E. fence, and 20 feet S. of front fence of dooryard. It is in the NE.  $\frac{1}{4}$  sec. 20, T. 34 N., R. 9 E., Will Co.

S. D. 144.—On the top of a large boulder lying 34 feet SW. of creek, 430 feet SW. of S. D. 143 and 253 feet SE. of SE. face (end) of culvert over first creek SW. of the Isaac Van Alstyne farmhouse (now occupied by an O'Brien) on the bluff road running S., W., and S. to Smiths Bridge over the Des Plaines River, or W. to *Channahon, Ill.* It is nearly W. of Millsdale. The bench square is now somewhat indistinct and the "highest point" may have been worn or broken away. Stone lies on unstable ground. (Note 45, p. 130.)

S. D. 143.—Near *Channahon, Will Co., Ill.*, on a large boulder 3.9 feet long by 3.6 feet wide by 1.5 feet above ground, lying near foot of hill slope 118 feet SE., or square out, from the SE. fence line of the bluff road, which, in this vicinity, gradually changes its direction from E. to N., and 464.75 feet E. of the center line of a small stone culvert, first SW. of the Isaac Van Alstyne farmhouse (now occupied by an O'Brien), on said road. In the SW.  $\frac{1}{4}$  sec. 11, T. 34 N., R. 9 E., Will County, Ill., and nearly W. of Millsdale. The stone is on springy, marshy ground. (Note 45, p. 130.)

P. B. M. 99.—Near *Channahon, Will Co., Ill.*; stone, pipe, and cap (see note 41, p. 129) set in the highway which crosses the Des Plaines River at *Millsdale, Ill.* It is on the NW. bank of the NW. channel of the river, 106 feet westward from the water edge, 40.65 feet WSW. from a 28-inch elm tree in highway, 86 feet NE. from a 19-inch burr oak, in pasture field, 139.5 feet WSW. from the W. end of the S. girder of the iron wagon bridge over NW. channel of river, and 27.5 feet SE., or square out, from center of wagon track. It is in the SW.  $\frac{1}{4}$  sec. 11, T. 34 N., R. 9 E., Will Co.

B. M. 25 A (Seddon).—Highest point in a circle cut on the top of the SW. corner of the E. stone abutment of the highway bridge over the W. channel (W. of Treats Island) of the Des Plaines River at *Millsdale, Ill.*, about 3 miles ENE. from Channahon. It is in the SW.  $\frac{1}{4}$  sec. 11, T. 34 N., R. 9 E., Will Co., Ill. The letters U. S. are cut near the circle.

S. D. 141.—Near *Millsdale, Will Co., Ill.*, on a large boulder lying in the bluff road running S., W., and S. to Smiths Bridge, 13 feet W. of E. fence line of road, near edge of bluffs. The bench 262.6 is feet N. along the road from the range of the N. side of William O'Brien's farmhouse. In the SW.  $\frac{1}{4}$  sec. 2, T. 34 N., R. 9 E., Will Co., Ill. (Note 45, p. 130.)

T. B. M. 424.—Highest point in a square cut on the top of the SE. bridge seat stone of the NE. abutment of small iron bridge over Rock Run on the Channahon road, which runs SW. from Joliet to Channahon, Ill., between the Des Plaines River and the Illinois and Michigan Canal. The bridge is about  $\frac{1}{4}$  mile NE. from where the road forks to Channahon and to Minooka, Ill. The bench is 1.03 feet from SW. face and 0.63 foot from SE. end of stone on which it is. Same as S. D. P. B. M. 137. The letters S. D. P. B. M. are cut near the bench.

P. B. M. 100.—Stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of Michael Meegan's house on the NW. side of the Channahon road, which runs SW. from *Joliet, Ill.*, between the Des Plaines River and the Illinois and Michigan Canal. It is about 725 feet NE., along the road, from the bridge over Rock Run. The bench is 93.9 feet SSE. from the E. corner of house, 83.8 feet SE. from the S. corner of house, 1.8 feet NE. of the range of the SW. side of house, and 3.77 feet from front dooryard fence; in the SW.  $\frac{1}{4}$  sec. 26, T. 35 N., R. 9 E., Will Co., Ill.

T. B. M. 427.—Highest point in a square cut on the top of a red granite boulder, bluntly wedge-shaped upward, obliquely truncated at NE. corner, about 2.1 feet wide, 3.7 feet in extreme length, E. and W., and 0.7 foot above ground. It lies in the barnyard of Caleb A. Glasscock, on the NW. side of the Channahon road, running SW. from *Joliet, Ill.*, between the Des Plaines River and the Illinois and Michigan Canal. It is about 1.76 miles NE., along this road, from Rock Run bridge. The bench is 35.3 feet from NW. fence line of road, 34.25 feet E. from SE. corner of his barn, 123 feet W. from SW. corner of house, and 152.6 feet WNW. from the NW. corner of a barn across the road from his house; near the SE. corner of sec. 24, T. 35 N., R. 9 E., Will Co., Ill.

T. B. M. 429.—Near *Rockdale, Will Co., Ill.*; highest point in a square cut on the top of a granite boulder lying in the Channahon road, running southwestward from *Joliet, Ill.*, between the Des Plaines River and the Illinois and Michigan Canal, at a point 3.55 feet from northerly fence line of road, and 134.5 feet NNE. from the NW. corner of red frame house on the Folk's farm, being 107.5 feet easterly from the range of the westward side of house, and 81.8 feet northerly from the range of the northward or front side of house. This stone is in a depression or ravine across which the fill for the roadway appears to have been made by throwing in stones, so that the bench stone is in a pile of stones. It is about 1 mile westward from Brandon's bridge. Same as S. D. P. B. M. 133. The letters S. D. P. B. M. are cut about the square.

S. D. 135.—Near *Rockdale, Will Co., Ill.*; center punch mark in the end of copper bolt leaded horizontally into stone foundation wall at NE. end of large red barn on Folk's farm, on the SSE. side of the Channahon road, about 2 miles below *Joliet, Ill.* The bolt is 1 foot below weatherboards in second course down from top of wall, and 19.2 feet SE. along the wall from the N. corner of the barn. This barn is S. from S. D. P. B. M. 133 or T. B. M. 429. The end of the bolt and the lead surrounding it were found mutilated by a cold chisel, but otherwise apparently undisturbed. A new center was made in the end of the bolt and used in determining the elevation. Of the original marking, S. D. P. B. M., only the letter S is now visible.

P. B. M. 101.—Stone, pipe, and cap (see note 41, p. 129) set in the front dooryard of a house, owned by Henry H. Stassen & Son, on the northerly side of the Channahon road, between the Illinois and Michigan Canal and the Des Plaines River, at *Rockdale, Ill.* It is about  $\frac{1}{4}$  mile SW., following the highway, from Brandon's bridge over the canal. It is 49 feet southwestward from a 0.7-foot box-elder tree in same yard, 46.75 feet southwesterly from SW. corner of house, 2.47 feet from front fence of yard, 13.3 feet SW. from an 8-inch box-elder tree, and 31.7 feet S. from a second 8-inch box elder; in the NE.  $\frac{1}{4}$  sec. 20, T. 35 N., R. 10 E., Will Co., Ill.

S. D. 130.—In the northerly face of the S. abutment of Brandon's bridge over the Illinois and Michigan Canal at *Rockdale, Ill.*, a suburb of *Joliet*. The bolt is in the third course of stone up from the ground and 10.35 feet eastward from the W. end of abutment. The end of the bolt appears to have been hammered, so that the center point was destroyed. A new center was made in the bolt before determining its elevation. (Note 46, p. 130.)

P. B. M. 102.—Top of copper bolt leaded vertically into top of coping stone of E. wing wall of N. abutment of Brandon's bridge over the Des Plaines River, near *Rockdale* (a suburb of *Joliet*), *Ill.* The bolt is 0.9 foot back from E. face of wing wall, 2.73 feet E. from upper face of upstream girder of bridge, and 0.6 foot N. from the N. end of bridge. This bench was found in place and marked S. D. P. B. M., to which is added U. S. P. B. M.

T. B. M. 432.—Near the E. corner of capstone at SE. end of rectangular stone culvert on Railroad street in *Joliet, Ill.*, being the first street W. from and parallel to the Illinois and Michigan Canal. This culvert is about 0.6 mile NE. from Brandon's bridge. It is opposite stone quarry to its westward and is over drain from quarry. It is 138 feet W. from SW. corner of house No. 1004, having yard surrounded by stone fence, and 274 feet NE. along street from range of N. side of house No. 1114. The square is 0.48 foot from SE. face of capstone and 0.75 foot from its NE. end. (Note 42, p. 129.)

T. B. M. 433.—Highest point in W. angle of the cross, within a circle, cut on the top of the S. stone bridge seat of the W. abutment (W. side of canal) of the wagon bridge over the Illinois and Michigan Canal and the Des Plaines River on McDonough street in *Joliet, Ill.* The center of the circle is 0.5 foot W. from E. face of stone, 0.25 foot E. of E. end of iron plate under expansion rollers, and 0.23 foot S. of S. face of inclined end post. Same as U. S. B. M. 14, Seddon, of 1899. It is marked U. S.

P. B. M. 103.—In top of stone coping course which forms the bridge seat course of the concrete abutment at the W. end of Jefferson street bridge over the Des Plaines River, in *Joliet, Ill.* The bolt is near the S. end of abutment, being 1.25 feet from S. end of coping course, 1.9 feet from its E. edge, and 1.84 feet E. of E. face of concrete earth wall. (Note 43, p. 129.)

S. D. 127.—In the center of the third course of stone up from the ground, in the S. wall of the courthouse, in *Joliet, Ill.*, at a point 0.85 foot W. of its SE. corner. (Note 46, p. 130.)

T. B. M. 434.—Center of cross cut on top of the middle one of the three vertical bolts, securing to the W. concrete wall of lock the lower curved strap of hinge at top of wooden quoin post of lower W. gate of Lock No. 5, of the Illinois and Michigan Canal, just above Bridge or Jackson street, in *Joliet, Ill.* This bolt is 3.15 feet southwestward from center of wooden quoin post and 2.3 feet back from W. face of tail-bay. It is marked U. S. on iron strap.

T. B. M. 435.—*Joliet, Will Co., Ill.*, on the same bridge and course as P. B. M. 104; highest point in a circle cut on the top of the SE. corner of the SW. end stone. The circle is 11.5 feet SW., along the face of the wing wall, from the angle at its junction with the abutment, 0.12 foot back from face of wing wall, and 0.15 foot from SW. end of stone. Same as U. S. B. M. 10, Seddon, of 1899. The letters U S are cut near the circle.

P. B. M. 104.—In the SE. face of the fourth course up from the ground, or sixth course down from the bridge seat in the S. wing wall of the W. stone abutment of Ruby or Columbia Street bridge, over the Illinois and Michigan Canal and the Des Plaines River, in *Joliet, Ill.* The bolt is 0.86 foot SW., along the face of the wing wall, from the angle at its junction with the abutment. (Note 47, p. 130.)

T. B. M. 436.—On the top of the W. stone retaining wall of the Illinois and Michigan Canal, at a point 91 feet N. from the range of the upper end of the canal basin, opposite the steel works, in the N. part of *Joliet, Ill.* The bench is 0.45 mile up the canal from Ruby Street bridge. The square is 0.5 foot back from face of wall and 2.1 feet from S. end of stone on which it is. (Note 42, p. 129, except square is below U S.)

P. B. M. 105.—In the center of a depressed square cut on the top of the coping below the bridge seat, and near the NE. corner of the NW. abutment of the Chicago, Santa Fe and California R. R. bridge over the Illinois and Michigan Canal, just below Lock No. 4 of the canal, in the northern part of *Joliet, Ill.* The bolt is 0.57 foot from NE. end of coping, 0.53 foot from its SE. edge, and about 2.7 feet above ground. Same as S. D. P. B. M. 119 and U. S. B. M. 9, Seddon, of 1899. (Note 43, p. 129, except that the lettering is S. D. P. B. M.)

P. B. M. 106.—In top of the third step up from the ground (middle of third main course) in the SW. wing wall of the NW. stone abutment of the Elgin, Joliet and Eastern R. R. bridge over the Illinois and Michigan Canal, just below Lock No. 3 of the canal, in the northern outskirts of *Joliet, Ill.* The bolt is 0.87 foot back from SE. face of wall, 0.84 foot from SW. end of step, 34 feet SW., along the face of the wing wall, from its angle with the abutment, and about 3.85 feet above ground. (Note 43, p. 129.)

S. D. 117.—Cut on the top of the W. wall of Lock No. 3 of the Illinois and Michigan Canal, which is N. from *Joliet, Ill.*, and just above the Elgin, Joliet and Eastern R. R. bridge over the canal. The bench is at N. end of recess for W. lower gate, the center of square being 0.38 foot N. of N. end of recess, and 0.41 foot W. of W. face of lock chamber. Same as U. S. B. M. 7, Seddon, of 1899. (Note 45, p. 130, except the letter P is omitted.)

T. B. M. 437.—Near *Joliet, Will Co., Ill.*, on the top of the south stone of the remains of the W. abutment of a former R. R. bridge over the Illinois and Michigan Canal, 0.67 mile N., along the canal, from P. B. M. 106. The present railway track, along the W. side of the canal, terminates about 20 feet N. of the bench. This old abutment is about 2 feet back from the face of the W. retaining wall of canal. The bench is 0.33 foot from S. end of stone and 0.38 foot from E. face of abutment. (Note 42, p. 129.)

T. B. M. 438.—On the top of the W. wall of Lock No. 2 of the Illinois and Michigan Canal, at a point 0.3 foot back from E. face of tail-bay to lock chamber and 0.6 foot below the S. side of wooden quoin post of lower W. gate. It is about 1.5 miles below *Lockport, Ill.* Same as S. D. P. B. M. 110, U. S. B. M. 6, Seddon, of 1899, and D. W. S. No. 58. (Note 45, p. 130.)

S. D. 109.—Highest point in a square cut on the W. wall of Lock No. 2 of the Illinois and Michigan Canal (second lock below *Lockport, Ill.*) at a point 5.3 feet N. of N. end of recess for upper gate and 0.3 foot W. of E. face of head bay. The square is at a joint in the wall coping stones. The letters S. D. are cut, one at either side of the square, and the letters B. M. near by. The bench appears to have been injured.

S. D. 107.—Highest point in E. angle of a cross cut on top of W. wall of Lock No. 1 of the Illinois and Michigan Canal at *Lockport, Ill.* The cross is at E. angle in wall at N. end of recess of W. lower gate, and is 11 feet N. of the wooden quoin post of this gate. "Same as U. S. No. 6." Same as U. S. B. M. 4, Seddon, of 1899.

S. D. 106.—Highest point in a square cut on the top of the W. wall of Lock No. 1 of the Illinois and Michigan Canal at *Lockport, Ill.*, at point of curve in head bay wall, 5.15 feet N. of N. end of recess for W. upper gate, 15.9 feet N. of the wooden quoin post of this gate, and 0.3 foot back from face of wall. It is at the S. side of a joint of the coping stones. The letters B. M. S. D. are cut near the square. "Same as D. W. S. No. 57."

P. B. M. 107.—In the top of the W. end stone of the third course up from the ground, or eighth course down from the bridge seat, in the W. wing wall of the NW. stone abutment of the bridge over the Illinois and Michigan Canal, on the Chicago and Alton R. R. side track to mills, W. of canal, in *Lockport, Ill.* The bolt is 0.54 foot back from S. face of wing wall, 0.98 foot from W. end of stone, and 11.4 feet westward, along the face of the wing wall, from angle at its junction with abutment. (Note 43, p. 129.)

P. B. M. 108.—In E. face of W. stone abutment of Sixteenth Street bridge, over the Illinois and Michigan Canal, in *Lockport, Ill.* The bolt is in the third course up from the ground (fifth below bridge seat), 10.73 feet S. from N. end (angle) of abutment, and 3.9 feet above the towpath. (Note 47, p. 130.)

S. D. 116.—In the N. water table of the building known as "Arnold's Building," on the SW. corner of State and Ninth streets in *Lockport, Ill.* The bolt is 21.7 feet W. of the NE. corner of building. (Note 46, p. 130.)

S. D. 114.—In the E. face of the W. stone abutment of Ninth Street bridge of the Illinois and Michigan Canal in *Lockport, Ill.* The bolt is in the fifth course, 4.25 feet up from the ground, and 1.89 feet S. along the face of the wall, from the N. end of abutment. (Note 46, p. 130.)

T. B. M. 440.—*Lockport, Ill.*, on the same bridge seat course as P. B. M. 109. The bench is 0.64 foot from E. end and 0.66 foot from S. face of coping. (Note 42, p. 129.)

P. B. M. 109.—In the top of the bridge seat or coping course of the N. abutment of bridge No. 38 of the Chicago, Santa Fe and California R. R. in *Lockport, Ill.* This bridge is some 500 feet S. from depot. The bolt is 0.91 foot from W. end of coping, 1.25 feet from S. face of coping, and 1.3 feet from S. face of earth wall of abutment. (Note 43, p. 129.)

P. B. M. 110.—In the top of the bridge seat or coping course of the S. abutment of bridge No. 37 A of the Chicago, Santa Fe and California R. R. This bridge is E. of the controlling works of the Chicago Drainage Canal at *Lockport, Ill.* The bolt is 0.65 foot from E. end and 0.66 foot from N. face of coping. (Note 43, p. 129.)

P. B. M. 111.—In top of stone doorstep of the S. double doors of the brick building at S. end of wastewear at the controlling works of the Chicago Drainage Canal at *Lockport, Ill.* The bolt is 0.88 foot from E. end of stone, 0.25 foot back from front edge of step, and 0.55 foot W. from E. brick jamb of doorway. (Note 43, p. 129.)

T. B. M. 441.—Near *Lockport, Will Co., Ill.*, on the top of E. concrete wall of the Chicago Drainage Canal, 2.33 feet back from face of wall, 3.67 feet from rear edge of wall, and 0.707 mile from P. B. M. 111 at the controlling works. It is opposite a Sanitary B. M. near front edge of wall. (Note 42, p. 129.)

Sanitary B. M.—Near *Lockport, Will Co., Ill.*, 0.17 foot back from the E. face of the canal, 2.16 feet W. of, or opposite, T. B. M. 441, and near a gauge on vertical face of canal wall, being the highest point in a square. The figures +4941 are cut near this bench.

T. B. M. 442.—Near *Lockport, Will Co., Ill.*, on the top of E. concrete wall of the Chicago Drainage Canal, 2.14 feet back from face of wall, 4.18 feet from rear edge of wall, 1.46 feet southeasterly from an eyebolt in top of wall (for supporting life cable), and 1.36 miles northward from P. B. M. 111 at the controlling works. There is a jog in the W. concrete wall of canal and a break in the W. spoil bank, nearly opposite the bench. A break in the E. spoil banks occurs about 200 feet above the bench. (Note 42, p. 129.)

T. B. M. 443.—On the top of the short section of concrete wall (132 feet in length) on the E. side of the Chicago Drainage Canal, first above the long concrete wall, extending northward from the controlling works. The bench is 42.85 feet N. of the S. end of this wall, 2.36 feet back from face of wall, and 0.8 foot E. of eyebolt in top of wall (for supporting life cable). It is 2 miles from P. B. M. 111 at controlling works and 1.17 miles below the wagon bridge over the canal at *Romeo, Ill.* (Note 42, p. 129.)

T. B. M. 444.—On the top of a short section of stone retaining wall on the E. side of the Chicago Drainage Canal, 0.45 mile below the wagon bridge over the canal at *Romeo, Ill.* The bench is 54 feet from S. end of wall, 133 feet from N. end of wall, 2.07 feet back from front face of wall, and 126.6 feet S. from P. B. M. 112 on same section of wall. (Note 42, p. 129.)

P. B. M. 112.—In the top of a short section of stone retaining wall on the E. side of the Chicago Drainage Canal, at a point 0.43 mile below the wagon bridge over the canal at *Romeo, Ill.* The bolt is 6.4 feet below, measured along the face of the wall, the extreme upper end of wall (upper end not square across), 1.7 feet back from face of wall, and 2.2 feet from rear edge of wall. (Note 43, p. 129.)

S. D. 94.—Highest point in a square cut at E. edge of coping of W. retaining wall of the Illinois and Michigan Canal, at a point "87 feet S. of S. side of highway bridge over canal" (88.2 feet S. of S. end of floor beams of bridge) in *Romeo, Ill.* It is 68.75 feet northeasterly from the NE. corner of stone foundation of elevator building just W. of towpath. The square is not marked. "Same as D. W. S. No. 54."

P. B. M. 113.—In the top of the bridge seat or coping course of the pier at the E. end of the draw span of the wagon bridge over the Chicago Drainage Canal at *Romeo, Ill.* The bolt is near the S. end of the pier, being 0.94 foot from S. end of coping and 0.95 foot W. of its E. edge. (Note 43, p. 129.)

S. D. 93.—In the E. face of W. abutment of highway bridge over the Illinois and Michigan Canal in *Romeo, Ill.* The bolt is in the fifth course, 4.15 feet up from the ground, and 3 feet N. of SE. corner of abutment. (Note 46, p. 130.)

Sanitary B. M.—*Romeo, Will Co., Ill.*, on the N. end of the pier at the E. end of the highway draw-bridge over the Chicago Drainage Canal, being the highest point of a circular niche cut on the quarry-faced projection on the N. face of the fourth course down from the coping, or bridge seat course, 1.1 feet W. of the NE. corner of the pier and 5.94 feet down from the top of the coping course. The letters B. M. are cut near the bench.

T. B. M. 445.—On the top of a short section stone retaining wall on the E. side of the Chicago Drainage Canal, at a point 0.577 mile above the center line of the wagon bridge over the canal at *Romeo, Ill.* The square is 24.25 feet from S. end of wall, 23.5 feet from its N. end, 1.1 feet back from face of wall, and 3.34 feet from rear edge of wall. It is opposite, and W. from, a point on the Chicago, Santa Fe and California R. R. track about 95 paces S. from the beginning of the long curve in this track about 0.6 mile N. of *Romeo*. There is a corresponding short section of stone retaining wall on opposite side of the canal. (Note 42, p. 129.)

T. B. M. 446.—On the top of the bared rock, in place, along the E. side of the Chicago Drainage Canal, at a point 1.11 miles northward, along the canal, from the center line of the wagon bridge over the canal at *Romeo, Ill.*, and about 0.22 mile southward, along the canal, from the quarry dock of the Lemont Limestone Co. on W. side of canal. The square is 2.9 feet back from vertical side of the canal and 5.84 feet southerly from an eyebolt on canal bank (for supporting life cable). About opposite this bench the height of the spoil bank on the W. side of the canal changes, being higher to the southward. On the E. side of the canal the spoil bank opposite and above the bench is of considerable height. (Note 42, p. 129.)

T. B. M. 447.—On the top of the bared rock, in place, along the E. side of the Chicago Drainage Canal, at a point 1.755 miles northward along the canal, from the center line of the wagon bridge over the canal at *Romeo, Ill.*, and 0.246 mile southwestward, along the canal, from the lower side of engine house at dock of Western Stone Company's quarry No. 6, on SE. bank of canal. The square is 7.84 feet back from vertical side of canal, 2 feet from edge of earth, and 8.6 feet SSW. from an eye-bolt on bank (for supporting life cable). (Note 42, p. 129.)

T. B. M. 449.—On the top of the bared rock, in place, on the SSE. side of the Chicago Drainage Canal, at a point 0.33 mile ENE. of the range of the northeasterly side of the stone-crusher building on the northward side of the canal, known as Western Stone Co.'s No. 5; 1.377 miles WSW. along the canal, from center line of the wagon bridge over the canal at *Lemont, Ill.*, and 0.23 mile ENE. along the canal from Will-Cook county line, as indicated by tablet set in northerly wall of canal. The square

is 6.4 feet back, square out, from vertical face of canal, 2.3 feet from edge of earth, and 4.68 feet SE. from an eyebolt on bank (for supporting life cable). (Note 42, p. 129.)

T. B. M. 450.—On the top of the bared rock, in place, on the SSE. side of the Chicago Drainage Canal, at a point 0.69 mile below, WSW., along the canal, from the center line of wagon bridge over canal on Stevens street, in *Lemont, Ill.* It is 290 feet WSW., along the canal, from the lower end of high S. spoil banks, about opposite the middle of the second curve below Lemont depot, in the Chicago, Santa Fe and California R. R. track, and opposite telephone pole No. 673 of the Sanitary District line, being 44.8 feet distant from this pole. The square is 4.3 feet back, square out, from vertical face of canal, 1.8 feet back from eyebolt on canal bank opposite bench, and 4.8 feet from edge of earth. (Note 42, p. 129.)

T. B. M. 451.—Highest point in semicircular niche cut on quarry-faced projection on NNW. face of a stone in the first course up from the ground in the SSE. abutment of the drawbridge over the Chicago Drainage Canal, on Stevens street, in *Lemont, Ill.* The bench is 1.94 feet above ground and 5.9 feet ENE. along the abutment from the angle at its junction with SW. wing wall. This is a Sanitary District bench. The letters B M were cut above the niche and U S is added below it.

P. B. M. 114.—In the top of the sandstone bridge seat or coping course of the NNW. abutment of the drawbridge over the Chicago Drainage Canal, on Stevens street, in *Lemont, Ill.* The bolt is 1.89 feet northward from angle in coping course at junction of abutment with its westerly wing wall, 1.47 feet out from face of earth wall of abutment, and 2.62 feet westward from the center of the westward bearing wheel under northerly end of land span of draw. (Note 43, p. 129.)

P. B. M. 115.—In the top of the W. end stone of the second course above ground (fourth course below bridge seat) in the W. wing wall of the S. abutment of the Chicago, Santa Fe and California R. R. drawbridge over the Chicago Drainage Canal at *Lemont, Ill.* The bolt is 1.1 feet back from the face of the wing wall, 2.2 feet from W. end of stone on which it is, and 23.1 feet westward along the face of the wing wall from the angle at its junction with the abutment. (Note 43, p. 129.)

S. D. 88.—In center of water table on the NNW. side of Dutton's stone building standing on the SE. corner of Stevens and Talcott streets in *Lemont, Ill.* The bolt is 1.65 feet eastward along the water table from its NW. corner. (Note 46, p. 130.)

S. D. 80.—Highest point in a square cut on the top of the flagging at the NW. corner of Dutton's stone building on the SE. corner of Stevens and Talcott streets in *Lemont, Ill.* The center of the square is 0.28 foot from the easterly edge and 0.14 foot from the northerly edge of the flagging. The letters B. M. are cut near the square.

S. D. 79.—In the SSE. face of the NW. one of four stone piers supporting trusses carrying traveling crane over the Illinois and Michigan Canal at Western Stone Co.'s quarry, No. 2, in *Lemont, Ill.* The bolt is 4.3 feet ENE., along the face of the pier, from its SW. corner, and in the tenth course down from the top of the pier (sixth course up from the ground). (Note 46, p. 130.)

T. B. M. 452.—On the top of the stone retaining wall on the SSE. side of the Chicago Drainage Canal, 0.505 mile ENE. along the canal from the drawbridge over it on Stevens street in *Lemont, Ill.* The square is 1.7 feet back from face of wall, 0.86 foot SSE. from an eyebolt in wall (for supporting life cable), 21 feet WSW. along the canal from the upper end of long stone retaining wall, first above R. R. bridge at Lemont, and 333 feet in the same direction from the lower side of engine house at Illinois Stone Co.'s dock on canal. (Note 42, p. 129.)

P. B. M. 116.—In the top of stone retaining wall on the SSE. side of the Chicago Drainage Canal, 1.287 miles ENE. along the canal from the drawbridge over it on Stevens street in *Lemont, Ill.* It is 795.5 feet in the same direction from the upper side of the engine house at the dock on the canal of Western Stone Co.'s quarry No. 1 and 93.85 feet WSW. along the canal from the upper end of a long stone retaining wall. The bolt is 2.26 feet back from face of wall and 2.1 feet from its rear edge on a coping stone 5.7 feet long. (Note 43, p. 129.)

T. B. M. 453.—On the top of the stone retaining wall on the SSE. side of the Chicago Drainage Canal, at a point 1.9 miles ENE., along the canal, from the drawbridge over it, on Stevens street, in *Lemont, Ill.* It is 0.322 mile WSW., along the canal, from the lower end of the curved portion of this wall, at the curve in the canal, between Sag and Lemont. The square is 1.32 feet back from face of wall, and 2.72 feet from rear edge of wall, on a coping stone 3.85 feet face length. It is about 250 feet below a levee running S. from the canal to the farmhouse, near the Illinois and Michigan Canal, occupied by George Nagel. In the SW.  $\frac{1}{4}$  sec. 15, T. 37 N., R. 11 E., Dupage Co., Ill. (Note 42, p. 129.)



P. B. M. 117.—In the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point 509 feet below the upper end of the curve in this wall at the bend in the canal between Sag and Lemont, Ill. The bolt is 2.03 feet back from the face of wall, and 1.9 feet from rear edge of wall on a through coping stone of 2.7 feet face length. In sec. 15, T. 37 N., R. 11 E., Dupage Co. (Note 43, p. 129.)

Lower Sanitary B. M.—Near Lemont, Cook Co., Ill., on the top of the SE. wall of the Chicago Drainage Canal, about 1 193.5 feet NE., along the wall, from P. B. M. 117, about 684.5 feet, in the same direction, from the upper end of the curve in this wall at the bend in the canal between Sag and Lemont, Ill., and 31 feet below, opposite telephone pole No. 564, being a square, 0.2 foot on a side, 0.45 foot back from the face of the wall. Marked B. M.

Upper Sanitary B. M.—On the top of the SE. wall of the Chicago Drainage Canal, about 1 728.5 feet NE., along the wall, from P. B. M. 117, about 1 219.5 feet, in the same direction, from the upper end of the curve in this wall at the bend in the canal between Sag and Lemont, Ill., about 4 feet above, opposite telephone pole No. 561, and 6.85 feet SW. from steel rope ladder on canal wall, being a square 0.17 foot on a side, 0.45 foot back from face of wall. Marked B. M.

T. B. M. 454.—On the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point 0.567 mile NE., along the canal, from the upper end of the curve in this wall at the bend in the canal between Sag and Lemont, Ill. It is nearly N. of the junction of the Calumet Feeder with the Illinois and Michigan Canal, and nearly W. from the farmhouse, on the NW. bank of the Illinois and Michigan Canal, occupied by Joseph Polarek. It is 228.85 feet SW., along the canal, from the lower side of the engine house at the Delaney Stone Co.'s dock, on canal, and about opposite Sag Bridge station of the Chicago and Joliet Electric Ry. The square is 1.96 feet back from face of wall, on coping stone 6 feet long. In the NW.  $\frac{1}{4}$  sec. 14, T. 37 N., R. 11 E., Dupage Co. (Note 42, p. 129.)

T. B. M. 455.—On the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point 0.77 mile NE., along the canal, from the lower side of the engine house at the Delaney Stone Co.'s dock, on canal, opposite Sag Bridge Station of the Chicago and Joliet Electric Ry. It is 118 feet below a ditch, about 250 feet long, at right angles to canal, bordered with poplars, and emptying into the Illinois and Michigan Canal. It is 7.92 feet SW. from an eyebolt, in canal wall, and 25 feet SW. from opposite telephone pole No. 524. The square is 1.33 feet back from face of wall, and 1.93 feet from rear edge of wall, on a stone 3 feet in length and 3.2 feet thick. (Note 42, p. 129.)

T. B. M. 456.—Near Willow Springs, Cook Co., Ill., on the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point 1.21 miles NE., along the canal, from the lower side of the engine house at the Delaney Stone Co.'s dock, on canal; and 0.467 mile SW., along the canal, from P. B. M. 118, which is opposite Philip Koch's farmhouse. The square is 1 foot back from the face of the wall. (Note 42, p. 129.)

P. B. M. 118.—In the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point 42.5 feet NE., along the canal, from the lower end of wall next above, about 755 feet of mostly natural rock canal bank, situated between two long stretches of built retaining wall. It is opposite Philip Koch's farmhouse and suspension footbridge over the Illinois and Michigan Canal. It is 1.569 miles, along the canal, below the lower end of the curve in this wall, at the bend in the canal, below Willow Springs, Ill. The bolt is 1.64 feet back from face of wall, and 22.8 feet below an eyebolt in wall, on a stone 6.5 feet in face length. In the NE.  $\frac{1}{4}$  sec. 12, T. 37 N., R. 11 E., Cook County, Ill. (Note 43, p. 129.)

S. D. 64.—Near Willow Springs, Cook Co., Ill., in the NE. wing wall of the NW. stone abutment of Philip Koch's suspension footbridge over the Illinois and Michigan Canal, about 1.67 miles above Sag. The bolt is 2.3 feet N., along the wing wall, from the E. corner of abutment and 1.75 feet down from the top of the old abutment. This bridge abutment is now much out of plumb and the courses in the wing wall inclined, indicating a settlement which is also shown by the levels. (Note 46, p. 130.)

S. D. 63.—Near Willow Springs, Cook Co., Ill., on the same bridge, abutment, and wall as S. D. 64; highest point in the SE. quarter of a circle cut on the top of the second step down from the top of the old bridge abutment. The bench is 4.95 feet N., along the wing wall, from the E. corner of abutment, 0.3 foot back from face of wing wall and 0.45 foot from N. end of step. This bench has settled due to the settlement of the abutment. "Same as U. S. No. 27." Marked B M on horizontal part of step and S D on its vertical face.

S. D. 62.—Near *Willow Springs, Cook Co., Ill.*, on the same bridge, abutment, and wall as S. D. 64; highest point a small square, within a larger square, cut on the NE. corner of a stone. This bench is near the toe of earth embankment forming the NNW. approach to bridge, 15.1 feet ENE. or square out from the range of the upper cable of bridge and 11.25 feet NNW. from the southerly face of abutment. This bench stone has the appearance of having been moved from its original place in the wing wall, and the levels show that its displacement has been nearly a foot. The letters S. D. P. B. M. are cut near the square. "Same as D. W. S. No. 40."

T. B. M. 457.—On the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, 0.692 mile NE., along the canal, from P. B. M. 118, and 0.877 mile below the lower end of the curve in this wall, at the bend in the canal, below *Willow Springs, Ill.* It is about 60 feet above an opening in the spoil banks on this side. The square is 2.5 feet back from face of wall and 2.83 feet from rear edge, on a stone of 7.3 feet face length. In the SW.  $\frac{1}{4}$  sec. 6, T. 37 N., R. 12 E., Cook County. (Note 42, p. 129.)

T. B. M. 458.—On the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point 0.2 mile below the lower end of the curve in this wall, at the bend in the canal, below *Willow Springs, Ill.* The square is 1.65 feet back from face of wall and 1.35 feet from rear edge of wall, on a coping stone having a face length of 6.9 feet and a width about 1 foot less than width of wall. The square is about 13.5 feet above opposite telephone pole, No. 454, of the Sanitary District line. (Note 42, p. 129.)

P. B. M. 119.—Center of cross cut on the top of a 1-inch iron bolt set in the top of the stone retaining wall on the SE. side of the Chicago Drainage Canal, at a point on the curved portion of this wall, 469.25 feet below the upper end of the curve, at the bend in the canal, below *Willow Springs, Ill.* The bolt projects 1.5 inches above the stone and is 1.6 feet back from face of wall, on a through coping stone 2.45 feet thick and 3.6 feet face length. This bolt was found in place. It is lettered U. S. P. B. M.

T. B. M. 459.—On the top of the lowest step of the SW. wing wall of the SE. abutment of the highway drawbridge over the Chicago Drainage Canal at *Willow Springs, Ill.*, being on the top of the fifth course of stone up from the ground in this wing wall. The square is 0.87 foot back from face of wall, 1.2 feet from S. end of wing wall, and 1.45 feet from S. end of course next above. (Note 42, p. 129.)

Sanitary B. M.—*Willow Springs, Cook County, Ill.*, on the SE. side of the octagonal stone pier of the highway drawbridge over the Chicago Drainage Canal, being highest point in a semicircular niche cut on the quarry-faced projection in the first course above ground, 2.95 feet NE. from the southerly angle of octagonal pier, and 1.15 feet above ground. Marked B. M. below the bench.

S. D. 54.—In the SW. end wall of the stone foundation of Chas. Piper's barn, about 250 feet northerly from the northeastward corner of wagon bridge over the Des Plaines River at *Willow Springs, Ill.* The bolt is 1.9 feet down from top of foundation, and 10 feet NW. along the wall, from SW. corner of barn. (Note 46, p. 130.)

S. D. 51.—On the top of the SW. bridge-seat stone of the SE. abutment of the wagon bridge over the Illinois and Michigan Canal at *Willow Springs, Ill.* The square is 2 feet SW. from the center of the inclined end post of SW. truss, and 1.65 feet back from the NW. face of abutment. "Same as D. W. S. No. 50." (Note 45, p. 130, except B. and M. are interchanged.)

S. D. 50.—Highest point in the SE. quarter of a circle cut on the top of the SW. bridge-seat stone of the NW. abutment of the wagon bridge over the Illinois and Michigan Canal at *Willow Springs, Ill.* The circle is 0.31 foot from SW. end of stone, 0.19 foot back from face of abutment, and 1.54 feet SW. from SW. face of inclined end post of lower truss. "Same as U. S. No. 43." Marked with the letters P. B. M. S. D. around the circle.

P. B. M. 120.—In the top of the sandstone coping course of the octagonal stone pivot pier of the highway drawbridge over the Chicago Drainage Canal at *Willow Springs, Ill.* The bolt is 1.1 feet radially in from the SSW. angle of octagon and 1.16 feet radially out from the cogs of the iron base of turntable. (Note 43, p. 129.)

P. B. M. 121.—In the top of the stone doorstep of the door on the SW. side of Henry B. Koller's brick block on the N. corner of Wentworth and Archer avenues in *Willow Springs, Ill.* The bolt is 0.16 foot back from face of step, 0.59 foot from its NW. end, and 7.36 feet from NW. corner of building. It is marked on the vertical face of stone step, below the bolt. (Note 43, p. 129.)

S. D. 57.—The top of a cast-iron Standard bench mark set in Archer avenue at *Willow Springs, Ill.*, at a point 0.59 foot square out from the SE. fence line of avenue, 68.11 feet NE. from the N. corner

of J. M. Abbitt's store building, 141.6 feet E. from the E. corner of John Zenk's brick saloon, 150.3 feet WSW. from the W. corner of Mrs. D. W. Crumpacker's residence, and 20 feet SE. from the outer rail of the SE. track of the Chicago and Joliet Electric Ry. The top of this bench is nearly even with the ground surface. The cast-iron post has a cross section in the form of a plus.

T. B. M. 460.—On the top of the uppermost course of stone in the NW. abutment for bridge (now gone) over the Illinois and Michigan Canal at *Mount Forest, Ill.* The center of this abutment is about 80.5 feet below opposite the center of the Chicago and Alton R. R. depot at Mount Forest. The square is 1.14 feet back from face of abutment, and 2.41 feet from SW. end of top course. (Note 42, p. 129.)

S. D. 49.—*Mount Forest, Cook Co., Ill.*, on the same bridge and abutment as T. B. M. 460; highest point in the NW. quarter of a circle cut on the third step from the bottom in the SW. wing wall. The center of this abutment is about 80.5 feet below opposite the center of Mount Forest depot building of the Chicago and Alton Ry. The circle is 0.25 foot from W. end of step, and 0.5 foot back from face of wing wall. The bench mark and the letters are quite weather worn. "Same as U. S. No. 65." Marked S. D. above the circle and P. B. M. below it.

S. D. 48.—*Mount Forest, Cook Co., Ill.*, on the same bridge and abutment as T. B. M. 460; highest point in a square cut on the top of the uppermost course. The center of this abutment is about 80.5 feet below opposite the center of Mount Forest depot building of the Chicago and Alton Ry. The bench is near the E. corner of the NE. end of top course, 0.1 foot from SE. face, and 0.15 foot from NE. end of stone. "Same as D. W. S. No. 49." The letters S. D. B. M. are cut near the square.

T. B. M. 461.—Near *Mount Forest, Cook Co., Ill.*; highest point in a square cut on the top of a large boulder situated on the NW. side of the Illinois and Michigan Canal, 18.5 feet back from the front edge of towpath, 420 feet NE., along the canal, from the center of the remains of an old wooden abutment of railroad bridge (now gone) over said canal, and 197 feet ENE. from the N. corner of stone foundation of "Piper's residence above Mount Forest" (house gone). It is 1.795 miles, along the towpath, above Wentworth avenue in Willow Springs, Ill., and 38.3 feet ENE. from telephone pole No. 426. The boulder is about 5 feet N. and S., 4 feet E. and W., and 2.6 feet high. Same as S. D. P. B. M. 46, which is the same as an older bench. Marked U. S. P. B. M. below the square.

T. B. M. 462.—Near *Mount Forest, Cook Co., Ill.*; highest point in a square cut on the top of the SW. one of two boulders, 5.5 feet apart, situated on the NW. side of the Illinois and Michigan Canal at a point 2.145 miles, along the towpath, above Wentworth avenue in Willow Springs, Ill., and 2.254 miles below the Chicago and Calumet Terminal R. R. bridge over said canal. The bench is 20 feet back from front edge of towpath, 32.5 feet ENE. from double cottonwood tree, and 58.75 feet SW. from telephone pole No. 408. The bench stone is about 3 feet square at the ground, from which it projects from 6 to 8 inches. Near the center of sec. 27, T. 38 N., R. 12 E., Cook County. Same as S. D. P. B. M. 45. (Note 45, p. 130, except that the letters are all below the square.)

T. B. M. 463.—Near *Summit, Cook Co., Ill.*; highest point in a square cut on the top of a limestone boulder lying in the towpath on the NW. side of the Illinois and Michigan Canal at a point 1.52 miles along the canal below the Chicago and Calumet Terminal R. R. bridge over said canal, and about 1 010 feet below where the wagon track leaves the towpath to follow along the top of the spoil banks. It is about opposite the middle of a row of 10 willow trees, parallel to the canal and from 50 to 75 feet back of the spoil banks, 94 feet below an apple tree at SE. foot of spoil banks, and 14.35 feet SE. from telephone pole No. 373. The boulder is 9.5 feet back from front edge of towpath, and lies between the towpath proper and the wagon track, which is about 2 feet the higher, so that one side of the stone is covered and the other exposed. The square is near the NE. end of the stone, which is about 1.6 by 2.3 feet in plan. The letters U. S. are cut to the SE. of the square on the sloping face of the stone.

T. B. M. 464.—Near *Summit, Cook Co., Ill.*; highest point in a square cut on the highest part of a "large embedded granite boulder at cove or recess in spoil banks" on NW. side of the Illinois and Michigan Canal, "about 3 460 feet" SW. along the towpath from the center of the Chicago and Calumet Terminal R. R. bridge over the canal. The boulder lies near the foot of the SE. slope of the spoil banks, 7 feet SE. from telephone pole No. 331, 23 feet back from front angle of towpath, and 6.35 feet NE. from a 3-inch crab-apple tree. There are a few other small trees NE. from the bench. Same as S. D. P. B. M. 41. The letters S. D. P. B. M. are cut on the inclined surface of the stone, which is nearly on a level with the ground surface.

T. B. M. 465.—On the top of the third step down from the top of the W. wing wall of the NW. abutment of the Chicago and Calumet Terminal R. R. bridge over the Illinois and Michigan Canal, about 1 mile below *Summit, Ill.* The square is 0.39 foot back from S. face of wing wall, 0.71 foot from W. end of step, and 13.33 feet SW. from inside of SW. rail of SW. track. (Note 42, p. 129.)

P. B. M. 122.—In the top of the bridge seat, or coping course, of the SE. abutment of the Chicago and Calumet Terminal R. R. bridge over the Chicago Drainage Canal, about 1 mile below *Summit, Ill.* The bolt is near the SW. end of abutment, being 1.85 feet from front edge of coping stone, 1 foot from SW. edge of cast-iron bridge seat, 1.75 feet in front of earth wall of abutment, and 1.05 feet from the SSE. edge of coping. (Note 43, p. 129.)

S. D. 40.—Center punch mark in the end of copper bolt leaded horizontally into the NE. end of the third course down from the iron bridge seat (second course below the coping course) of the NW. abutment of the Chicago and Calumet Terminal R. R. bridge over the Illinois and Michigan Canal, about 1 mile below *Summit, Ill.* The bolt is about 4.9 feet above ground and 0.83 foot NW. from the E. corner of abutment. The letters S. D. P. B. M. are cut near the bolt.

S. D. 39.—Near *Summit, Cook Co., Ill.*, highest point in the SW. quadrant of a circle cut on the top of a flat limestone boulder, about 3.3 feet N. and S. by 4.8 feet E. and W., lying on the SE. slope of the spoil banks on the NW. side of the Illinois and Michigan Canal, 40 feet back from the front edge of towpath, and 270.5 feet NE. from the inside of the outer rail of the NE. track of the Chicago and Calumet Terminal R. R. The bench is about 9.15 feet SSE. from the center of a red granite boulder. "Same as U. S. No. 87." Marked B at left of circle, M at right, and S D above.

Sanitary B. M.—About 1 mile below *Summit, Cook Co., Ill.*, on the SW. end stone of the second course down from the top of the earth wall of the SE. abutment of the Chicago and Calumet Terminal R. R. bridge over the Chicago Drainage Canal, being highest point in a square cut 6 inches back from westerly angle of stone. Marked B M, the square being between the letters.

P. B. M. 123.—Stone, pipe, and cap (see note 41, p. 129) set in the NW. corner of the front dooryard of William T. Welbourn's brick residence on the eastward side of the Archer road, between the Michigan Central Ry. right of way and the German Lutheran Church property, about  $\frac{1}{2}$  mile S. of *Summit, Ill.* It is 64.15 feet WNW. from the NW. corner of Mr. Welbourn's residence; 115.3 feet WSW. from the SW. corner of his large red barn; 167.4 feet SW. from Triangulation Station Chicago West Base; 36.8 feet E. of the center of the E. track of the Chicago and Joliet Electric Ry.; and 1.95 feet E. and 1.27 feet S. of front and N. dooryard fences, respectively.

Chicago West Base.—Same as S. D. 38; top of agate hemisphere marking Triangulation Station West Base of the Chicago base line, Lake Survey of 1877. This geodetic point is situated in the front yard of William T. Welbourn's large red barn, on the E. side of Archer road, between the Michigan Central R. R. right of way and the German Lutheran Church property, about  $\frac{1}{2}$  mile below *Summit, Ill.* It is 2.5 feet W. of W. side of barn, 68.9 feet N. of SW. corner of barn, 114.34 feet E., or square out, from the center of E. track of the Chicago and Joliet Electric Ry., 171.4 feet NNE. from the NW. corner of Mr. Welbourn's brick residence, 167.4 feet NE. from P. B. M. 123, 80.4 feet southerly from the SW. corner of Lutheran Church, and 106.3 feet SSE. from a 28-inch oak tree in front yard of church. The two original "stone reference posts" are standing. The bench mark is 1.7 feet below ground surface.

T. B. M. 466.—On the top of the horizontal base of the coping of the lower wing wall of the WNW. concrete abutment of the highway bridge over the Illinois and Michigan Canal at *Summit, Ill.* The square is 0.83 foot back from face of abutment and 0.85 foot from lower end of wing walls. (Note 42, p. 129.)

P. B. M. 124.—In the top of the stone coping, or bridge seat course, of the SE. abutment of the highway drawbridge over the Chicago Drainage Canal at *Summit, Ill.* The bolt is 1.5 feet back from NW. edge of coping, 0.97 foot from W. edge of coping, and 0.79 foot in front of the earth wall of abutment. (Note 43, p. 129.)

Sanitary B. M.—*Summit, Cook Co., Ill.*, very near P. B. M. 124, being the highest point in a square 1.45 feet back from NW. face of coping and 0.88 foot in front of earth wall of abutment. Marked B at the left and M at the right of the square.

T. B. M. 468.—Near *Summit, Cook Co., Ill.*, on the top of a granite boulder lying on the southerly slope of the spoil banks on the NNW. side of the Illinois and Michigan Canal, 19 feet back from front edge of towpath, and 2.1 feet S. of the line of telephone poles, nearer the canal, being 63.7 feet above pole No. 57 and 44.5 feet below pole No. 56. It is about 125 feet ENE. from the range of the NE. side of the Chicago, Santa Fe and California R.R. drawbridge over the Chicago Drainage Canal. The boulder is about 1.5 feet N. and S. by 2.2 feet E. and W. in plan. (Note 42, p. 129.)

P. B. M. 125.—In the top of the bridge seat, or coping course, of the SE. abutment of the Chicago, Santa Fe and California R. R. drawbridge over the Chicago Drainage Canal, about 1.7 miles NE. from *Summit, Ill.* The bolt is on the SW. end stone of the bridge seat course, 2.23 feet from its NW. edge, 0.79 foot from its SW. edge, 0.81 foot from SW. edge of base of cast-iron bridge seat, and 1.4 feet in front of earth wall of abutment. (Note 43, p. 129.)

P. B. M. 126.—Stone, pipe, and cap (see note 41, p. 129) set 48.65 feet SSE., or square out, from a point on the inside of the southerly rail of the Chicago, Santa Fe, and California R. R., 1 783.5 feet eastward, measured along this rail, from the crossbeam at the SE. end of said railroad's drawbridge over the Chicago Drainage Canal, which is about 1.7 miles NE. from *Summit, Ill.* The bench is 457.5 feet above the whistling board east of the bridge, 1.1 feet SSE., or square out, from the southerly right-of-way fence line, and 23.2 feet in the same direction from telegraph pole on R. R. right of way. It is 2 feet NE. from the range of two telephone poles, in different lines, on the Illinois and Michigan Canal right of way, the nearer pole being 20 feet SE. and the farther pole, No. 47, being 73.5 feet SE. from the bench. It is 112.8 feet NNE. from pole No. 48 in the line of poles nearer the Illinois and Michigan Canal.

S. D. 22.—Near *Chicago, Ill.*; the top of a cast-iron Standard B. M. set at NNW. foot of the spoil banks on the NNW. side of the Illinois and Michigan Canal, 220.4 feet SSE. from the center of the Chicago, Santa Fe and California R. R. track, 30.25 feet square out from center of wagon track on top of spoil banks, about 118 feet above the upper end of that part of spoil banks densely overgrown with small willows, 1 279 feet SSW. along the spoil bank, from the range of the center line of culvert on the Chicago and Alton Ry. over creek, and 159 feet W. from S. D. P. B. M. 20 or T. B. M. 470. The original elm tree and telegraph pole witnesses have been cut off, but the stumps are still standing, the former 4 feet W. and the latter 2.7 feet E. of bench. The cast-iron post has a cross section in the form of a plus, 6 inches in extreme dimension, and projects about 6 inches above ground.

T. B. M. 470.—Near *Chicago, Ill.*; highest point in a square cut on the top of a granite boulder (embedded to near surface of ground), lying at southeasterly foot of spoil banks on the NNW. side of the Illinois and Michigan Canal, 7.3 feet back from present front angle of towpath, at a point 1 136 feet WSW., along the towpath, from the range of the center of a culvert on the Chicago and Alton R. R. over a creek entering the canal from the SE., about 260 feet above a part of the spoil bank densely overgrown with small willows, and "about 9 010 feet below the Belt Line R. R. bridge over the canal." The bench is 4.55 feet SE. from the center of telephone pole No. 15. Same as S. D. P. B. M. 20.

T. B. M. 471.—Near *Chicago, Ill.*; highest point in a square cut on the top of a granite boulder lying at southeasterly foot of spoil banks on the NNW. side of the Illinois and Michigan Canal, 14 feet back from front angle of towpath, at a point "about 5 390 feet below the Belt Line R. R. bridge over the canal." The bench is 469 feet SSW. from the Chicago, Santa Fe and California R. R. "Yard limits" sign; 13.5 feet SSE., or square out, from line of telegraph poles, being 59.2 feet eastward of pole No. 017 and 52.45 feet southwestward from pole No. 018, which is braced, and 205 feet WSW., along the towpath, from a 9-inch cottonwood tree at foot of spoil banks. Same as S. D. P. B. M. 19. It is marked with the letters U S and an arrow.

T. B. M. 472.—Highest point of a niche cut in the quarry-faced projection on the southerly face of the W. end stone of the second course up from the ground in the N. abutment of the Chicago and Western Indiana Belt R. R. bridge over the Illinois and Michigan Canal in *Chicago, Ill.* The bench is 3.5 feet up from the towpath and 4.1 feet ENE., along the face of the abutment, from its SW. corner. The letters U S are cut below the bench.

P. B. M. 127.—In the top of the SE. end stone of the second course down from the top of the earth and E. wing wall of the S. abutment of the four-track drawbridge of the Chicago and Western Indiana Belt R. R. over the Chicago Drainage Canal in *Chicago, Ill.* The bolt is 2.31 feet from SE. end of wing wall, 1.56 feet back from its face, 1.63 feet from the end of next course above, and about 16.85 feet E. of E. face of bridge. (Note 43, p. 129.)

S. D. 24.—*Chicago, Ill.*, on the same bridge and abutment as T. B. M. 472; the bolt is in the sixth course from the top and 8.35 feet N. from the range of the southerly face of abutment. (Note 46, p. 130.)

S. D. 18.—*Chicago, Ill.*, on the same bridge and abutment as T. B. M. 472; highest point in a square cut on the top of E. bridge-seat stone. The square is at E. edge of bridge seat, 1 foot S. of its NE. corner. Bridge-seat stone badly fractured. The letters S. D. P. B. M. are cut on E. vertical face of stone.

P. B. M. 128.—Stone, pipe, and cap (see note 41, p. 129) set in or near the east line of Crawford avenue in *Chicago, Ill.*, at a point 12 feet east of a N. and S. line of telephone poles along the E. side of this street, and on the prolongation of the nearer one, to the canal, of two lines of telephone poles paralleling the NNW. side of the Illinois and Michigan Canal, W. from Crawford avenue. It is 22.65 feet NE. from center of pole No. 078, and 34.07 feet SSE. from the pole next N. of the above (not numbered), both on the Crawford avenue line. It is 62 feet square out from the row of piles at the northerly water edge of canal, and 21.5 feet in the same direction from center of wagon track along this side of canal.

T. B. M. 474.—Highest point on the bottom of a square niche cut in the quarry-shaped projection on the SE. face of the NE. end stone in the fourth course below the coping, or bridge seat course, of the NW. abutment of the W. Chicago, Santa Fe and California R. R. bridge (on wye track) over the Illinois and Michigan Canal at Corwith, in *Chicago, Ill.* The bolt is 1.05 feet SW. from the E. corner of abutment and 5.89 feet below the top of the coping. The letters U S are cut below the bench.

P. B. M. 129.—In the top of the SW. end stone of the third course, up from the bridge seat, in the W. wing wall of the S. abutment of the Chicago, Santa Fe and California R. R. bridge over the Chicago Drainage Canal, opposite Corwith, in *Chicago, Ill.* The bolt is on the second step down from the top of the earth wall of abutment, 13.23 feet W. of the inner edge of the W. rail of W. track, 0.85 foot back from face of wing wall, and 1 foot from end of step. (Note 43, p. 129.)

Sanitary B. M.—*Chicago, Ill.*, on the same abutment of the same bridge as P. B. M. 129, being the highest point in a square cut on the top of the NE. corner of the stone at the junction of the earth wall and wing wall in the second course down from the top of the earth wall. The letters B. M. are cut near the square.

S. D. 16.—Highest point in the NW. quadrant of a circle cut on the top of the coping of the SW. wing wall of the same bridge and abutment as T. B. M. 474, in *Chicago, Ill.* The center of the circle is 0.21 foot from the NW. end, 0.21 foot from the SW. face, and 0.3 foot E. of W. corner of coping. It is 8.6 feet square out from the inside of SW. rail of track. "Same as U. S. No. 106." It is marked B M on top of coping, the circle being between the letters, and S. D. P. B. M. on the vertical face of the coping below the bench.

S. D. 15.—In the NE. face of the coping, or bridge seat course, of the same bridge and abutment as T. B. M. 474, in *Chicago, Ill.* The bolt is 1 foot along the face of the coping from its northerly corner, and 0.64 foot down from its upper surface. (Note 46, p. 130.)

S. D. 14.—Highest point in a square cut on the top of the projecting coping course below the bridge seat stone blocks of the N. abutment of the E. Chicago, Santa Fe and California R. R. bridge over the Illinois and Michigan Canal at Corwith, in *Chicago, Ill.* The square is at E. edge of coping, 3.8 feet N. from its SE. corner, 0.25 foot S. from directly beneath the S. end of coping to E. wing wall, and 1.63 feet E. from E. face of NE. bridge seat stone.

T. B. M. 475.—On the top of the coping, or bridge seat course, of the N. abutment of the Kedzie Avenue bridge over the Illinois and Michigan Canal, in *Chicago, Ill.* The square is near the W. end of the abutment, being 0.58 foot from S. face, and 0.69 foot from W. end of coping. (Note 42, p. 129.)

P. B. M. 130.—In the top of the coping course of the W. wing wall of the S. abutment of the Kedzie Avenue drawbridge over the Chicago Drainage Canal, in *Chicago, Ill.* The bolt is 0.25 foot back from the SE. face of coping, 0.46 foot in front of parapet wall surmounting coping of wing wall, 14.9 feet NE. along the wall from the SW. end of coping, and 12.7 feet W. from the range of the W. side of bridge. (Note 43, p. 129.)

Sanitary B. M.—*Chicago, Ill.*, on top of the E. corner of the coping of the parapet wall which surrounds the coping course of the E. wing wall of the same bridge and abutment as P. B. M. 130, being highest point in a square. Marked B. M.

P. B. M. 131.—In the top of the coping or bridge seat course of the E. abutment of the Chicago, Madison and Northern R. R. drawbridge over the Chicago Drainage Canal, in *Chicago, Ill.*, just E. of Kedzie avenue. The bolt is near the S. end of the abutment, being 2.45 feet back from W. face of coping, 1.8 feet in front of earth wall of abutment, 1 foot from S. edge of base of cast-iron bridge seat, and 1.34 feet from S. face of coping; in a concrete block forming the corner of the coping course. (Note 43, p. 129.)

South Sanitary B. M.—*Chicago, Ill.*, on the top of the SW. corner of the top course of stone in the earth wall of the same bridge and abutment as P. B. M. 131, being highest point in a square. Marked B. M.

North Sanitary B. M.—*Chicago, Ill.*, same as South Sanitary B. M., but on the top of the NW. corner.

T. B. M. 476.—Highest point in a square cut on the quarry-faced projection on the S. face of the E. stone of the first or lowest course above ground (thirteenth course down from top) of the N. abutment of California Avenue bridge over the Illinois and Michigan Canal, in *Chicago, Ill.* The square is 2.18 feet W. from E. end of abutment proper, or jog in abutment wall, and 1.25 feet above ground. The letters U S are cut below the bench.

T. B. M. 477.—On the top of the third step up from the ground (second step down from top) of the old wing wall at the extreme E. end of the N. abutment of the Pittsburg, Cincinnati, Chicago and St. Louis R. R. bridge over the Illinois and Michigan Canal, in *Chicago, Ill.* The square is 0.5 foot W. from E. corner of step, 18.25 feet E. of inside of E. rail of E. track (8 tracks), and 4.15 feet N. from face of abutment. (Note 42, p. 129.)

T. B. M. 478.—On the top of the coping stone of the lowest step of the N. curved wing wall of the E. abutment of the Chicago, Santa Fe and California R. R. bridge over South West Boulevard, in *Chicago, Ill.* The square is 12.75 feet E. of face of abutment and 22.2 feet NE. from its NW. corner. It is 1.5 feet from W. face and 1.25 feet from N. face of stone on which it is. (Note 42, p. 129.)

P. B. M. 132.—In the top of the second step down from the top of the E. wing wall of the S. abutment of the Pittsburg, Cincinnati, Chicago and St. Louis R. R. bridge over the Chicago Drainage Canal, in *Chicago, Ill.*, being on the E. end stone of the third course of stone in the abutment down from the top. The bolt is 1 foot from E. end of stone, 1 foot back from face of wing wall, and 11.4 feet E. of inside of E. rail of E. track (8 tracks). (Note 43, p. 129.)

P. B. M. 133.—In the N. face of the N. curved wing wall of the W. abutment of the Chicago, Santa Fe and California R. R. bridge over South West Boulevard, in *Chicago, Ill.* The bolt is in the fourth course of stone below the coping and 1.85 feet W. from the NE. corner of abutment proper. (Note 47, p. 130.)

P. B. M. 134.—In the top of the coping, or bridge seat course, of the S. abutment of the drawbridge on South West Boulevard and Western avenue over the Chicago Drainage Canal, in *Chicago, Ill.* The bolt is near the western end of abutment, being 1.4 feet back from N. face of coping, 1.5 feet E. from W. face of coping, 0.96 foot out from earth wall of abutment, and about 4.9 feet below sidewalk. (Note 43, p. 129.)

West Sanitary B. M.—*Chicago, Ill.*, on the top of the NW. corner of the coping course (below the parapet wall) of the W. wing wall of the same bridge and abutment as P. B. M. 134, being highest point in a square. Marked B. M.

East Sanitary B. M.—*Chicago, Ill.*, on the top of the NE. corner of the coping course (below the parapet wall) of the E. wing wall of the same bridge and abutment as P. B. M. 134, being highest point in a square. Marked B. M.

T. B. M. 479.—Highest point in a square cut on the top of a quarry-faced projection on the N. or back face of the NW. abutment of the Chicago, Santa Fe and California R. R. bridge over the Illinois and Michigan Canal, near Robey street, in *Chicago, Ill.*, about  $\frac{5}{8}$  mile below, WSW. of, the canal pumping works at Bridgeport. The square is on the bridge seat course of stone, which is the fourth course down from the top of the earth wall of abutment, and 3.4 feet westerly from the NE. corner of abutment. The letters U S are cut above the bench.

S. D. 9.—In the E. face of the same bridge and abutment as T. B. M. 479, in *Chicago, Ill.* The bolt is 1.7 feet N. of the SE. corner of abutment, 5.4 feet above ground in third course. (Note 46, p. 130.)

T. B. M. 480.—*Chicago, Ill.*; highest point in a square in the bottom of a niche on a quarry-faced projection on the S. face of the second course up from the ground, or sixth course below the coping course, of the same bridge and abutment as P. B. M. 135. The bench is 4 feet W. from the SE. corner of abutment, and 1.6 feet up from the ground. The letters U S are cut below the bench.

P. B. M. 135.—In the S. face of the N. abutment of the Ashland Avenue bridge over the Illinois and Michigan Canal, at Bridgeport, in *Chicago, Ill.* The bolt is 3.8 feet E. of the SW. corner of the abutment and 2.9 feet above ground, being in the third course above ground, or fifth course below the coping course. (Note 47, p. 130.)

S. D. 7.—Highest point in a square cut on the top of the NW. corner of stone foundation of N. brick chimney of boiler house of the Illinois and Michigan Canal pumping works on the W. side of Ashland avenue, at Bridgeport, in *Chicago, Ill.* The bench is 1.8 feet above ground. It appears to have shelled off some.

S. D. 6.—Highest point in a square cut on the top of the SW. corner of stone foundation of S. brick chimney of boiler house of the Illinois and Michigan Canal pumping works, on the W. side of Ashland avenue, at Bridgeport, in *Chicago, Ill.* The bench is 1.6 feet above ground. The outer half of the square has been broken off. The elevation given is of the remaining part. "Same as D. W. S. No. 13."

S. D. 2.—Highest part of the remaining half of a square cut near the front edge of the SE. wall of old lock of the Illinois and Michigan Canal, E. of Ashland avenue, at Bridgeport, in *Chicago, Ill.* The square is near the center of recess for E. gate of lock, and 265.7 feet NE. from the NE. corner of canal collector's office. "Same as D. W. S. No. 22." (Note 45, p. 130.)

S. D. 1.—On the SW. end of doorstep, on front or NW. side of canal collector's office, on the SE. side of the Illinois and Michigan Canal, 85.6 feet NE. from the NE. corner of S. abutment of Ashland avenue bridge over the canal, at Bridgeport, in *Chicago, Ill.* The square is 0.45 foot NE. from the SW. end of doorstep, and 0.2 foot back from its front face. This doorstep is now broken across near the middle of its length. "Same as D. W. S. No. 12." (Note 45, p. 130.)

T. B. M. 481.—On the top of the horizontal base part of the inclined coping of the N. concrete wing wall of the E. abutment of the bridge carrying the Chicago, Sante Fe and California R. R., the Chicago and Alton R. R., and Illinois Central R. R. over Quarry street, in *Chicago, Ill.* The square is 1.24 feet from W. face of coping, 0.87 foot from its N. end, and 0.75 foot from foot of inclined part of coping. (Note 42, p. 129.)

T. B. M. 482.—Highest point in a square cut on the top of the base, or foundation projecting course, of the W. concrete abutment of the bridge carrying the Chicago, Sante Fe and California R. R., the Chicago and Alton R. R., and the Illinois Central R. R. over Twenty-third place, and on the N. side of Archer avenue, in *Chicago, Ill.* The square is at the N. end of abutment, 0.45 foot E. of face of abutment, 0.23 foot S. of its N. end, 0.3 foot W. of E. face of foundation, projecting course, and 1 foot above street surface. Marked U S above the square.

T. B. M. 483.—On the top of the W. one of the eight sandstone bearing blocks, on which rests the iron columns of the same bridge as P. B. M. 136, in *Chicago, Ill.*, and which are situated between the roadway and the N. sidewalk of the street. The square is 0.52 foot from the S. and W. edges of the bearing block, respectively, 13.65 feet out from face of N. abutment, 16.65 feet SE. from its SW. corner, and 16.25 feet SW. from P. B. M. 136. The iron column over this bearing block has not yet been placed. (Note 42, p. 129.)

P. B. M. 136.—In the S. face of the fourth course up from the sidewalk in the N. stone abutment of the bridge carrying the Chicago, Rock Island and Pacific R. R. and the Lake Shore and Michigan Southern R. R. over Twenty-third street, in *Chicago, Ill.* The bolt is 0.55 foot E. of SW. corner of abutment and 5.3 feet above sidewalk. (Note 47, p. 130.)

T. B. M. 484.—On the top of stone sidewalk at the SE. corner of Twenty-second street and Michigan (avenue) Boulevard, in *Chicago, Ill.* The square is 10.54 feet E. of E. curb line of Michigan avenue and 16.3 feet S. of S. curb line of Twenty-second street, being at N. end of iron railing at W. tide of outdoor cellar stairway on E. side of avenue. (Note 42, p. 129.)

City 7.—Situated on Michigan (avenue) Boulevard 4 feet W. of the W. curb line of the avenue (or 11 feet E. of the W. line of the avenue) and 206.5 feet S. of the S. line of Twenty-second street, in *Chicago, Ill.* (Note 49, p. 130.)

T. B. M. 485—*Chicago, Ill.*; top of the W. vertical bolt, which secures to its masonry foundation the base of the cast-iron lamp-post situated on Michigan (avenue) Boulevard, 1.6 feet E. of E. curb line of avenue, 44.15 feet SW. from NW. corner and 38.15 feet W. from SW. corner of house No. 1441. Marked U S on the cast-iron base of the lamp-post.

P. B. M. 137.—On Michigan avenue, 4.15 feet E. of E. curb line and 26 feet S. of S. line of Harmon place, opposite Lake Park, in *Chicago, Ill.* Same as Chicago Standard bench No. 3. (Note 49, p. 130.)

P. B. M. 138.—On Michigan avenue, 4.3 feet E. of E. curb line and 15.3 feet S. of S. line of Congress street, opposite Lake Park, in *Chicago, Ill.* Same as Chicago Standard bench No. 2. (Note 49, p. 130.)

P. B. M. 139.—On the SE. corner of Michigan avenue and Randolph street, in *Chicago, Ill.*, being 29.35 feet E. of E. curb line of Michigan avenue and 24.17 feet S. of the center of S. parapet wall of approach to bridge on Randolph street over the Illinois Central R. R. tracks. Same as Chicago Standard bench No. 1. (Note 49, p. 130.)

T. B. M. 486.—Highest point in a square cut on the top of the N. stone foundation wall of the brick freight office of the Illinois Central R. R., situated on the S. side of Water street, in *Chicago, Ill.* The square is at N. edge of stone foundation, 9.75 feet W. from the NE. corner of building, and 2.7 feet above ground. The letters U S are cut on the brick work above the bench.

P. B. M. 99.—*Chicago, Ill.* (See App. 8, Report for 1899, p. 737, and App. 3, Report for 1903, p. 808.) The B. M. is of the type described in note 47, p. 130.



T. B. M. 488.—*Chicago, Ill.*, on the top of the N. stone curb of Michigan street, between Lincoln Park Boulevard (Pine street) and St. Clair street, 1.15 feet W. and 14 feet S. of the SW. corner of George Bullen & Co.'s elevators and 117.55 feet E. of the E. curb line of Lincoln Park Boulevard. The square is 0.2 foot back from face of curb. (Note 42, p. 129.)

P. B. M. 98.—*Chicago, Ill.* (See App. 8, Report for 1899, p. 737.) The B. M. is of the type described in Note 43, p. 129.

City 9.—On the NE. corner of Chicago avenue and Tower place (near water tower) 5.75 feet N. of N. curb line of Chicago avenue and 16.5 feet E. of E. curb line of Tower place, in *Chicago, Ill.* (Note 49, p. 130.)

B. M. VII.—*Chicago, Ill.* (See App. 8, Report for 1899, p. 737.) Same as S. D. P. B. M. 198 (1890-91), described as "at edge of bevel of water table, being highest point in triangle." In 1904 the outer corner of this bench was reported as "found to be broken off, and the elevation given is that of the remaining part of the triangle."

B. M. VI.—*Chicago, Ill.* (See App. 8, Report for 1899, p. 737.) Same as S. D. P. B. M. 205 (of 1890-91) and described as "at S. side of Chicago avenue, W. of N. Clark street, being highest point in square." In 1904 it was said "this square is at the S. edge of the base of iron post of fence, 0.26 foot W. of E. end of stone base and 0.28 foot N. of S. face of stone base."

P. B. M. 96.—*Chicago, Ill.* (See App. 8, Report for 1899, p. 736, and Note 47, p. 130.)

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN PEKIN AND CHAMPAIGN, ILL., ESTABLISHED BY THE UNITED STATES GEOLOGICAL SURVEY, 1905.

[From information furnished by the United States Geological Survey.]

A.—City.—*Pekin, Tazewell Co., Ill.*, on the E. side of the county office building on the court-house square; the top of a bolt in the stone water table beneath a window of the county clerk's office.

B.—*Pekin, Tazewell Co., Ill.*; a bronze tablet in the water table on E. side of county clerk's office, 2.65 feet N. of B. M. A. (Note 50, p. 130.)

P. B. M. 49.—*Pekin, Tazewell Co., Ill.*; U. S. Army Engineers B. M.; a copper bolt in top of E. abutment of traction line bridge across the Illinois River, 12 feet N. of center of track.

D.—1 mile W. of *Leslie, Tazewell Co., Ill.*, 6 miles E. of *Pekin*, 15 rails E. of milepost marked P15; 15 feet from center of Peoria and Eastern Ry. track; in coping stone of concrete culvert, aluminum tablet. (Note 50, p. 130.)

E.—*Tremont, Tazewell Co., Ill.*, at W. end of concrete platform of station, 25 feet SE. of street crossing, iron post. (Note 51, p. 130.)

F.—0.33 mile W. of *Menert, Tazewell Co., Ill.*, in top of N. end of E. abutment of plate girder bridge over Mud Creek, aluminum tablet. (Note 50, p. 130.)

G.—0.67 mile E. of *Menert, Tazewell Co., Ill.*, on top of and on S. end of W. abutment of a through bridge over Mackinaw River, 6 feet below top of rail, 3.5 feet from center of track, and midway between S. shoe plate and S. floor beam in first panel from W., aluminum tablet. (Note 50, p. 130.)

H.—*Mackinaw, Tazewell Co., Ill.*, 175 feet W. of station, in top of first cap in E. pier of first row of piers to railroad water tank, aluminum tablet. (Note 50, p. 130.)

I.—*Lilly, Tazewell Co., Ill.*, in top of SW. corner of W. end of concrete platform of R.R. station, 5 feet N. of center of track, aluminum tablet. (Note 50, p. 130.)

J.—*Woodruff, McLean Co., Ill.*, 900 feet W. of coaling sheds, 30 feet S. of center of track, on right-of-way line in front of house of N. C. Osman, iron post. (Note 51, p. 130.)

K.—*Danvers, McLean Co., Ill.*, in top of SW. corner of W. end of concrete platform of station about 120 feet S. of station, aluminum tablet. (Note 50, p. 130.)

L.—4.5 miles E. of *Danvers, McLean Co., Ill.*, in coping of E. wall of a wagon pass under railroad 6 feet N. of center of track, aluminum tablet. (Note 50, p. 130.)

M.—*Twin Grove, McLean Co., Ill.*, at N. end of station platform, due S. of elevator owned by F. Supple, 10 feet S. of track, iron post. (Note 51, p. 130.)

N.—0.75 mile W. of *Bloomington, McLean Co., Ill.*, Chicago, Alton and Big Four junction, in S. side of W. abutment of a plate girder bridge across a creek used as an open sewer for the city, 6 feet below top of rail and 15 feet from center of track, aluminum tablet. (Note 50, p. 130.)

O.—*Bloomington, McLean Co., Ill.*, in N. pier of the water tank about 350 feet E. of passenger station and on S. side of track, aluminum tablet. (Note 50, p. 130.)

P.—*Bloomington, McLean Co., Ill.*, in SE. corner of court-house, about 2 feet above ground and in face of wall, aluminum tablet. (Note 50, p. 130.)

Q.—2 miles W. of *Gillum, McLean Co., Ill.*, in top of parapet wall of and on S. side of concrete arch 300-88 across a draw on the Big Four R. R.; 20 feet from center of track, aluminum tablet. (Note 50, p. 130.)

R.—*Gillum, McLean Co., Ill.*, 75 feet W. of station, 20 feet from center of track, on S. side and 1.75 feet below rail, iron post. (Note 51, p. 130.)

S.—*Downs, McLean Co., Ill.*, 360 feet E. of station, 15 feet S. of center of track, 10 feet NW. of section car house, iron post. (Note 51, p. 130.)

T.—0.67 mile W. of *Ford Woods, McLean Co., Ill.*, in coping stone on N. side of stone arch 293-94 on R. R., 12 feet from center of track, aluminum tablet. (Note 50, p. 130.)

U.—*Le Roy, McLean Co., Ill.*, 330 feet E. of station, 20 feet S. of center of track, at intersection of right-of-way line and street line, iron post. (Note 51, p. 130.)

V.—*Empire, McLean Co., Ill.*, 130 feet W. of station, 15 feet N. of center of track and 15 feet E. of switch stand at siding, iron post. (Note 51, p. 130.)

W.—1 mile W. of *Farmer City, De Witt Co., Ill.*, in top of and on W. side of abutment of a small I-beam bridge on railroad, 10 feet from center of track, aluminum tablet. (Note 50, p. 130.)

X.—*Farmer City, De Witt Co., Ill.*, 375 feet E. of junction of Big Four and Illinois Central Rys., 18 feet S. of center of track and 65 feet S. of where first street E. of Peoria and Eastern Ry. station crosses tracks, iron post. (Note 51, p. 130.)

Y.—*Harris, De Witt Co., Ill.*, 60 feet W. of station, 16 feet N. of center of tracks, iron post. (Note 51, p. 130.)

Z.—*Mansfield, De Witt Co., Ill.*, 270 feet E. of Wabash and Big Four R. R. crossing, 18 feet S. of the center of Big Four, iron post. (Note 51, p. 130.)

A<sub>1</sub>.—3.5 miles E. of *Mansfield, De Witt Co., Ill.*, in S. end of the W. abutment of plate-girder bridge 270-40 on the Big Four R. R., aluminum tablet. (Note 50, p. 130.)

B<sub>1</sub>.—*Mahomet, Champaign Co., Ill.*, 230 feet W. of station, 15 feet N. from center of track, iron post. (Note 51, p. 130.)

C<sub>1</sub>.—2 miles W. of *Mahomet, Champaign Co., Ill.*, in top of S. side of stone culvert 266-11 on Peoria and Eastern Ry., 10 feet from center of tracks, aluminum tablet. (Note 50, p. 130.)

D<sub>1</sub>.—*Rising, Champaign Co., Ill.*, 75 feet W. of station, 15 feet N. of center of tracks, iron post. (Note 51, p. 130.)

E<sub>1</sub>.—2 miles W. of *Champaign, Champaign Co., Ill.*, in S. side of W. abutment of a small I-beam bridge on Big Four Ry., 15 feet S. of center of track, aluminum tablet. (Note 50, p. 130.)

F<sub>1</sub>=Z<sub>4</sub>.—*Champaign, Champaign Co., Ill.*, 53 feet SE. of SE. corner of Engineering Building at University of Illinois, iron post stamped "Prim. Trav. Sta. No. 1."

G<sub>1</sub>.—*Champaign, Champaign Co., Ill.*, on S. side of E. entrance to Engineering Building, University of Illinois, aluminum tablet. (Note 50, p. 130.)

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN OLNEY AND CHAMPAIGN, ILL., ESTABLISHED BY THE UNITED STATES GEOLOGICAL SURVEY, 1906.

[From information furnished by the United States Geological Survey.]

C. & G. S. II.—*Olney, Richland Co., Ill.* (See App. 8, Report for 1899, p. 566.)

C. & G. S. B<sub>3</sub>.—*Olney, Richland Co., Ill.* (See App. 8, Report for 1899, p. 566.)

A<sub>3</sub>.—*Olney, Richland Co., Ill.*, in top of W. stone balustrade of steps at S. entrance of Richland Co. court-house; aluminum tablet stamped "483 1906." (Note 50, p. 130.)

B<sub>3</sub>.—2.87 miles N. of *Olney, Richland Co., Ill.*, 45 feet W. of road crossing, 40 feet N. of road, in SE. corner of lot owned by J. M. Fleming; iron post stamped "465 1906." (Note 51, p. 130.)

C<sub>3</sub>.—5.36 miles N. of *Olney, Richland Co., Ill.*, 30 feet E. of tracks, 40 feet SE. of private road crossing, 50 feet SE. of whistle post, 10 feet S. of gate to house; iron post stamped "475 1906." (Note 51, p. 130.)

D<sub>3</sub>.—*Dundas, Richland Co., Ill.*, 439 feet N. of station, 50 feet NE. of road crossing, 30 feet E. of track, in SW. corner of Dundas Rolling Mill; aluminum tablet stamped "480 1906." (Note 50, p. 130.)

E<sub>3</sub>.—1.59 miles N. of *West Liberty, Jasper Co., Ill.*, 160 feet N. of milepost 169-78, 70 feet S. of bridge B 168-93, 590 feet S. of road crossing, 30 feet E. of tracks, E. of right-of-way line; iron post stamped "480 1906." (Note 51, p. 130.)

F<sub>3</sub>.—4.52 miles N. of *West Liberty, Jasper Co., Ill.*, 8 feet W. of milepost 166-81; iron post stamped "506 1906." (Note 51, p. 130.)

G<sub>3</sub>.—1.84 miles N. of *Boos, Jasper Co., Ill.*, 40 feet NE. of milepost 163-84, in fence corner, 25 feet E. of track, 15 feet E. of warning post, 50 feet SE. of road crossing; iron post stamped "524 1906." (Note 51, p. 130.)

H<sub>3</sub>.—*Newton, Jasper Co., Ill.*, 180 feet NW. of station, 70 feet W. of railroad crossing, 20 feet W. of water plug on S. side of road; iron post stamped "512 1906." (Note 51, p. 130.)

I<sub>3</sub>.—3.03 miles N. of *Newton, Jasper Co., Ill.*, 165 feet S. of milepost 157-90, in fence corner, 30 feet E. of track, 10 feet N. of private road crossing; iron post stamped "538 1906." (Note 51, p. 130.)

J<sub>3</sub>.—1.4 miles N. of *Falmouth, Jasper Co., Ill.*, 40 feet E. of track, at edge of fence, 50 feet E. of milepost 154-93, 175 feet W. of oil derrick; iron post stamped "564 1906." (Note 51, p. 130.)

K<sub>3</sub>.—1.05 miles N. of *Rose Hill, Jasper Co., Ill.*, 553 feet N. of milepost 151-96, in fence corner, 35 feet SE. of road crossing; iron post stamped "566 1906." (Note 51, p. 130.)

L<sub>3</sub>.—0.31 mile N. of *Hidalgo, Jasper Co., Ill.*, 30 feet W. of track, 8 feet W. of milepost 148-99; iron post stamped "581 1906." (Note 51, p. 130.)

M<sub>3</sub>.—3.37 miles N. of *Hidalgo, Jasper Co., Ill.*, 245 feet N. of milepost 145-102, 30 feet E. of tracks, 9 feet N. of center of road through field, at edge of right of way; iron post stamped "593 1906." (Note 51, p. 130.)

N<sub>3</sub>.—*Greenup, Cumberland Co., Ill.*, 700 feet NW. of station, 40 feet N. of track, 570 feet SE. of milepost 142-105; iron post stamped "543 1906." (Note 51, p. 130.)

O<sub>3</sub>.—3.18 miles NW. of *Greenup, Cumberland Co., Ill.*, 45 feet NW. of road crossing, 25 feet N. of warning post, 15 feet W. of wagon road; iron post stamped "553 1906." (Note 51, p. 130.)

P<sub>3</sub>.—0.75 mile N. of *Toledo, Cumberland Co., Ill.*, 210 feet N. of milepost 136-111, in fence corner, 35 feet W. of track, 10 feet N. of private road to Glenn Mowel house; iron post stamped "602 1906." (Note 51, p. 130.)

Q<sub>3</sub>.—*Bradbury, Cumberland Co., Ill.*, 630 feet N. of station, 25 feet W. of track, 3 feet W. of milepost 133-114; iron post stamped "607 1906." (Note 51, p. 130.)

R<sub>3</sub>.—2.94 miles N. of *Bradbury*, and 0.53 mile S. of *Janesville, Cumberland Co., Ill.*, 30 feet W. of track, in fence corner, 20 feet S. of road; iron post stamped "676 1906." (Note 51, p. 130.)

S<sub>3</sub>.—2.60 miles NW. of *Janesville, Cumberland Co., Ill.*, 235 feet S. of milepost 127-120, in fence corner, 35 feet E. of track; iron post stamped "735 1906." (Note 51, p. 130.)

T<sub>3</sub>.—*Lerna, Coles Co., Ill.*, SE. corner of station, on E. side, corner of platform, 113 feet NW. of junction; iron post stamped "753 1906." (Note 51, p. 130.)

U<sub>3</sub>.—3.01 miles NE. of *Lerna, Coles Co., Ill.*, 40 feet N. of track, 20 feet E. of road; iron post stamped "708 1906." (Note 51, p. 130.)

V<sub>3</sub>.—5.74 miles NE. of *Lerna, Coles Co., Ill.*, 50 feet N. of track, 25 feet E. of road, 20 feet W. of silver poplar tree; iron post stamped "615 1906." (Note 51, p. 130.)

W<sub>3</sub>.—*Charleston, Coles Co., Ill.*, in SW. corner of Clover Leaf station, 5 feet E. of entrance to baggage room, in stone coping; aluminum tablet stamped "672 1906." (Note 50, p. 130.)

X<sub>3</sub>.—*Charleston, Coles Co., Ill.*, Coles Co. court-house; 15 feet W. of N. entrance, in section of building occupied by post-office, on W. end of top step; aluminum tablet stamped "686 1906." (Note 50, p. 130.)

Y<sub>3</sub>.—3.68 miles N. of *Charleston, Coles Co., Ill.*, 35 feet E. of track, 25 feet N. of county road, in SW. corner of G. W. Wasson lot; iron post stamped "686 1906." (Note 51, p. 130.)

Z<sub>3</sub>.—0.95 mile NE. of *Fairgrange, Coles Co., Ill.*, 45 feet S. of rock, 25 feet S. of warning post, 25 feet E. of county road, 2 feet W. of fence corner; iron post stamped "686 1906." (Note 51, p. 130.)

A<sub>4</sub>.—0.85 mile NE. of *Bushton, Coles Co., Ill.*, 50 feet NE. of road crossing, 30 feet N. of county road, near fence corner; iron post stamped "666 1906." (Note 51, p. 130.)

B<sub>4</sub>.—1.58 miles NE. of *Rardin, Coles Co., Ill.*, 53 feet S. of private road crossing, 10 feet S. of angle in road; iron post stamped "658 1906." (Note 51, p. 130.)

C<sub>4</sub>.—*Oakland, Coles Co., Ill.*, 820 feet S. of junction, 60 feet W. of track, 140 feet NW. of milepost "St. L. 147-Toledo 304," 25 feet S. of wagon road; iron post stamped "652 1906." (Note 51, p. 130.)

D<sub>4</sub>.—2.98 miles N. of *Oakland, Coles Co., Ill.*, 50 feet E. of track, 30 feet E. of milepost "St. L. 150-T. 301," 465 feet N. of small bridge 302, in edge of field; iron post stamped "661 1906." (Note 51, p. 130.)

E<sub>4</sub>.—5.89 miles NE. of *Oakland* and 0.47 mile SW. of *Brocton, Edgar Co., Ill.*, 65 feet N. of road crossing, 35 feet W. of track, in fence corner; iron post stamped "661 1906." (Note 51, p. 130.)

F<sub>4</sub>.—2.36 miles NE. of *Brocton, Edgar Co., Ill.*, at Paynes Siding, 25 feet E. of tracks, 50 feet SE. of switch, 6 feet E. of telephone pole, and 15 feet N. of county road; iron post stamped "678 1906." (Note 51, p. 130.)

G<sub>4</sub>.—5.16 miles NE. of *Brocton* and 0.48 mile NE. of *Hughes, Edgar Co., Ill.*, 40 feet E. of track, 12 feet E. of telegraph pole; iron post stamped "655 1906." (Note 51, p. 130.)

H<sub>4</sub>.—1.47 miles N. of *Hume, Edgar Co., Ill.*, 1 000 feet N. of milepost "Olney 78-Sidell 7," 40 feet E. of track, 90 feet NE. of whistle post; iron post stamped "645 1906." (Note 51, p. 130.)

I<sub>4</sub>.—4.34 miles N. of *Hume, Edgar Co., Ill.*, 330 feet N. of milepost "Olney 81-Sidell 4," 25 feet W. of track and 5 feet N. of private road; iron post stamped "693 1906." (Note 51, p. 130.)

J<sub>4</sub>.—1.99 miles N. of *Hildreth, Edgar Co., Ill.*, at road crossing, 150 feet N. of Archie siding, 30 feet W. of track and 10 feet S. of road; iron post stamped "691 1906." (Note 51, p. 130.)

K<sub>4</sub>.—*Sidell, Vermilion Co., Ill.*, in W. side of high school, NW. corner, in stone water table, 2 feet S. of corner of building; aluminum tablet stamped "684 1906." (Note 50, p. 130.)

L<sub>4</sub>.—3.13 miles NE. of *Sidell, Vermilion Co., Ill.*, 50 feet E. of track, 10 feet N. of private road; iron post stamped "679 1906." (Note 51, p. 130.)

M<sub>4</sub>.—*Jamaica, Vermilion Co., Ill.*, 145 feet NW. of station, 100 feet W. of track, 30 feet N. of road, at SE. corner of Joe Collin's store (owned by Wm. Cohain); iron post stamped "677 1906." (Note 51, p. 130.)

N<sub>4</sub>.—2.22 miles N. of *Jamaica, Vermilion Co., Ill.*, 60 feet W. of track, 70 feet NW. of milepost "C. 134-T. 260," 195 feet NW. of switch; iron post stamped "668 1906." (Note 51, p. 130.)

O<sub>4</sub>.—56 feet NW. of *Fairmount Junction, Vermilion Co., Ill.*, 50 feet W. of Chicago and Eastern Illinois R. R. tracks, 60 feet W. of signal station, 35 feet N. of Wabash tracks, in fence corner; iron post stamped "654 1906." (Note 51, p. 130.)

P<sub>4</sub>.—3.32 miles E. of *Fairmount Junction, Vermilion Co., Ill.*, 40 feet directly N. of milepost "St. L. 178-Tol. 258," 30 feet N. of track; iron post stamped "672 1906." (Note 51, p. 130.)

Q<sub>4</sub>.—*Cailin, Vermilion Co., Ill.*, T. 19 N., R. 12 W., sec. 34, 195 feet N. of track, 30 feet W. of road, at "Champion's Corner;" iron post stamped "658 1906." (Note 51, p. 130.)

R<sub>4</sub>.—2.69 miles W. of *Fairmount, Vermilion Co., Ill.*, 40 feet N. of track, 50 feet N. of milepost "St. Louis 172-Tol. 264," iron post stamped "655 1906." (Note 51, p. 130.)

S<sub>4</sub>.—5.59 miles W. of *Fairmount, Vermilion Co., Ill.*, 35 feet N. of track, 25 feet E. of road, near fence corner; iron post stamped "664 1906." (Note 51, p. 130.)

T<sub>4</sub>.—*Homer, Champaign Co., Ill.*, 605 feet W. of station, 30 feet N. of track, 25 feet W. of road, at E. side of asphalt pavement; aluminum tablet stamped "674 1906." (Note 50, p. 130.)

U<sub>4</sub>.—3.56 miles W. of *Homer, Champaign Co., Ill.*, 45 feet N. of milepost "St. L. 163-T. 273," 35 feet N. of track, 5 feet N. of telegraph pole, iron post. (Note 51, p. 130.)

V<sub>4</sub>.—*Sidney, Champaign Co., Ill.*, in SW. corner of high school; aluminum tablet stamped "673 1906." (Note 50, p. 130.)

W<sub>4</sub>.—*Deers, Champaign Co., Ill.*, 65 feet W. of track, 25 feet S. of road, 70 feet N. of post-office and store of F. C. Edwards, at NE. corner of barn; iron post stamped "691 1906." (Note 51, p. 130.)

X<sub>4</sub>.—*Mira, Champaign Co., Ill.*, 30 feet W. of track, 30 feet S. of road, 3 feet W. of fence corner; iron post stamped "695 1906." (Note 51, p. 130.)

Y<sub>4</sub>.—*Urbana, Champaign Co., Ill.*, 1 059 feet E. of station, 220 feet N. of Wabash tracks, 45 feet S. of Big Four tracks, in SW. corner of stone culvert under Big Four R. R.; aluminum tablet. (Note 50, p. 130.)

Z<sub>4</sub>=E<sub>1</sub>.—*Champaign, Champaign Co., Ill.* (See p. 209.)

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN CHILLICOTHE AND PORTSMOUTH, OHIO, ESTABLISHED BY THE UNITED STATES GEOLOGICAL SURVEY, 1906.

[From information furnished by the United States Geological Survey.]

Q.—*Chillicothe, Ohio.* (See App. 8, Report for 1899, p. 564.)

A.—1.20 miles S. of *Renick, Ross Co., Ohio*, on W. side of N. abutment of R. R. bridge, on top of retaining wall; aluminum tablet stamped "617." (Note 50, p. 130.)

B.—0.19 mile S. of station at *Locks, Ross Co., Ohio*, on W. side of N. abutment of R. R. bridge over road, on top of retaining wall; aluminum tablet stamped "610." (Note 50, p. 130.)

C.—1.9 miles S. of *Locks, Ross Co., Ohio*, W. side of track, on top of R. R. culvert; aluminum tablet stamped "589." (Note 50, p. 130.)

D.—0.12 mile S. of *Higby, Ross Co., Ohio*, W. side of N. abutment of R. R. bridge, top of retaining wall; aluminum tablet stamped "589." (Note 50, p. 130.)

E.—385 feet S. of station at *Omega, Pike Co., Ohio*, W. side of N. abutment, top of retaining wall; aluminum tablet stamped "596." (Note 50, p. 130.)

F.—2.71 miles S. of *Omega, Pike Co., Ohio*, E. side of track, top of R. R. culvert; aluminum tablet stamped "571." (Note 50, p. 130.)

G.—0.3 mile S. of *Waverly, Pike Co., Ohio*, E. side of track; N. abutment of R. R. bridge, top of retaining wall; aluminum tablet stamped "570." (Note 50, p. 130.)

H.—2.73 miles S. of *Glen Jean, Pike Co., Ohio*, W. of track; top of N. abutment, E. side of highway bridge; aluminum tablet stamped "562." (Note 50, p. 130.)

I.—*Piketon, Pike Co., Ohio*, NW. corner of United Brethren Church, on foundation; aluminum tablet stamped "578." (Note 50, p. 130.)

J.—0.21 mile N. of *Sargents, Pike Co., Ohio*, E. of track at SW. corner of Sargent's farm primary traverse station, No. 17; iron post stamped "580." (Note 51, p. 130.)

K.—1.5 miles N. of *Wakefield, Pike Co., Ohio*, w.s. of N. abutment of R. R. bridge over creek; aluminum tablet stamped "551." (Note 50, p. 130.)

L.—0.08 mile N. of *Clifford, Scioto Co., Ohio*, E. of track, SW. corner of stone culvert over road; aluminum tablet stamped "556." (Note 50, p. 130.)

M.—0.25 mile N. of *Lucasville, Scioto Co., Ohio*, NW. corner of R. R. bridge over highway; aluminum tablet stamped "554." (Note 50, p. 130.)

N.—1 mile N. of *Davis, Scioto Co., Ohio*, SE. corner of S. abutment of R. R. bridge over highway; aluminum tablet stamped "559." (Note 50, p. 130.)

O.—1.08 miles S. of *Davis, Scioto Co., Ohio*, SW. corner of S. abutment of R. R. bridge over highway; aluminum tablet stamped "558." (Note 50, p. 130.)

P.—0.6 mile N. of *Vera, Scioto Co., Ohio*, SW. corner of stone arch over creek; aluminum tablet stamped "534." (Note 50, p. 130.)

U. S. E.—*Portsmouth, Scioto Co., Ohio*; square cut on the first course of foundation above ground, on SE. corner of post-office at NE. corner of Gallia and Chillicothe streets, 1 foot from E. corner and 1 foot above ground; marked U. S. B. M.

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN CHILLICOTHE AND COLUMBUS, OHIO, ESTABLISHED BY THE UNITED STATES GEOLOGICAL SURVEY, 1906.

[From information furnished by the United States Geological Survey.]

Q.—*Chillicothe, Ohio*. (See App. 8, Report for 1899, p. 564.)

A.—*Chillicothe, Ross Co., Ohio*, in wall at side of entrance to court-house; bronze tablet stamped "643.67." (Note 50, p. 130.)

C.—0.5 mile N. of *Chillicothe, Ross Co., Ohio*, in top of W. side of S. abutment of Norfolk and Western Ry. bridge, 12 feet from center of track, and 5.75 feet below top of rail; aluminum tablet, not stamped. (Note 50, p. 130.)

D.—*Delano, Ross Co., Ohio*, 90 feet SW. of station, in SE. corner of crossroads, in bridge seat; bronze tablet, not stamped. (Note 50, p. 130.)

E.—*Delano, Ross Co., Ohio*, near station, in top of concrete bridge over small stream, on Scioto Valley Traction Line, at SE. corner of crossroads; aluminum tablet, not stamped. (Note 50, p. 130.)

F.—1 000 feet N. of *Kingston, Ross Co., Ohio*, in SW. corner of top step of arch culvert; bronze tablet stamped "774 Columbus 1899." (Note 50, p. 130.)

G.—In *Pickaway Co.*, 0.75 mile N. of *Kingston, Ross Co., Ohio*, in SW. corner of top of stone arch over branch on Norfolk and Western Ry.; aluminum tablet, not stamped. (Note 50, p. 130.)

H.—0.75 mile S. of *Haysville, Pickaway Co., Ohio*, W. end of top of coping of arch culvert over small draw on Norfolk and Western Ry.; aluminum tablet, not stamped. (Note 50, p. 130.)

I.—4 miles S. of *Circleville, Pickaway Co., Ohio*, on N. end of W. abutment of covered bridge over Sippo Creek; bronze tablet stamped "707 Columbus 1899." (Note 50, p. 130.)

J.—At *Gregg* station, 1.62 miles S. of *Circleville*, *Pickaway Co., Ohio*, top of E. side of S. end of culvert on Norfolk and Western Ry., at the S. end of the siding; an aluminum tablet, not stamped. (Note 50, p. 130.)

K.—*Circleville*, *Pickaway Co., Ohio*, at the NE. corner of the E. wing of the court-house; iron post, not stamped. (Note 51, p. 130.)

L.—4 miles N. of *Circleville*, *Pickaway Co., Ohio*, 60 feet S. of viaduct over Scioto Valley Traction Co. line and Norfolk and Western Ry.; about 500 feet N. of the elevator at siding, 12 feet W. of the center of track of Norfolk and Western Ry.; iron post, not stamped. (Note 51, p. 130.)

M.—0.25 mile S. of *Cromley*, *Pickaway Co., Ohio*, in E. side of small stone culvert on Norfolk and Western Ry., in cover stone; aluminum tablet, not stamped. (Note 50, p. 130.)

N.—90 feet S. of station at *Duvals*, *Pickaway Co., Ohio*, on W. side of small stone culvert on Norfolk and Western Ry.; in center of top of coping stone, about 30 feet SW. of road crossing; aluminum tablet, not stamped. (Note 50, p. 130.)

O.—0.75 mile N. of *Duvals*, *Pickaway Co., Ohio*, on E. side of small stone culvert on Norfolk and Western Ry., at milepost "C. 18;" aluminum tablet, not stamped. (Note 50, p. 130.)

P.—*Lockbourne*, *Franklin Co., Ohio*, in top of S. pier, W. end of Norfolk and Western Ry. bridge over Ohio Canal; aluminum tablet stamped "716 Columbus 1899." (Note 50, p. 130.)

Q.—0.33 mile S. of *Rees*, *Franklin Co., Ohio*, in W. end of bridge seat of N. pier of Norfolk and Western Ry. bridge over Walnut River, 10 feet from center of track, 4 feet below rail; aluminum tablet not stamped. (Note 50, p. 130.)

R.—1 mile S. of *Valley Crossing*, *Franklin Co., Ohio*, in E. end of bridge seat of N. abutment of plate girder viaduct on Norfolk and Western Ry. over Scioto Valley Traction Co. line; aluminum tablet, not stamped. (Note 50, p. 130.)

S=City.—*Columbus*, *Franklin Co., Ohio*, at NE. corner of state capitol, on water table; city bench mark.

T.—*Columbus*, *Franklin Co., Ohio*, in NW. corner of court-house, below corner stone; aluminum tablet stamped "778 Columbus 1899." (Note 50, p. 130.)

DESCRIPTIONS OF PERMANENT BENCH MARKS FROM VALLEY CROSSING TO UHRICHSVILLE AND STATION  
15 P. O., OHIO, ESTABLISHED BY THE UNITED STATES GEOLOGICAL SURVEY, 1906.

[From information furnished by the United States Geological Survey.]

R.—1 mile S. of *Valley Crossing*, *Franklin Co., Ohio*. (See above.)

A.—0.82 mile NE. of *Bannon*, *Franklin Co., Ohio*, SE. corner of abutment of R. R. bridge; aluminum tablet stamped "753." (Note 50, p. 130.)

T. B. M. 6.—0.89 mile SE. of *Truro*, *Franklin Co., Ohio*, SW. corner of abutment, W. side of R. R. bridge; a chiseled square.

T. B. M. 9.—1.33 miles SE. of *Brice*, *Franklin Co., Ohio*, SW. corner of W. abutment of R. R. bridge; a chiseled square.

C.—1.12 miles SE. of *Harley*, *Fairfield Co., Ohio*, SW. corner of W. abutment of R. R. bridge; aluminum tablet stamped "865." (Note 50, p. 130.)

D.—*Basil*, *Fairfield Co., Ohio*, at station, in top of stone platform; aluminum tablet stamped "867." (Note 50, p. 130.)

E.—*Thurston*, *Fairfield Co., Ohio*, NW. corner of front steps of schoolhouse; aluminum tablet stamped "886." (Note 50, p. 130.)

F.—2.1 miles E. of *Thurston*, *Fairfield Co., Ohio*, NE. corner of abutment of highway bridge over creek, 230 feet S. of track; aluminum tablet stamped "935." (Note 50, p. 130.)

G.—0.79 mile E. of *New Salem*, *Fairfield Co., Ohio*, 53 feet N. of track; SW. corner of abutment of highway bridge; aluminum tablet stamped "952." (Note 50, p. 130.)

H.—*Thornport*, *Perry Co., Ohio*, SW. corner of schoolhouse, in stone step; aluminum tablet stamped "900." (Note 50, p. 130.)

I.—2.27 miles E. of *Thornport*, *Perry Co., Ohio*, S. of track, NW. corner of retaining wall of highway bridge; aluminum tablet stamped "880." (Note 50, p. 130.)

J.—*Glenford*, *Perry Co., Ohio*, SE. side of schoolhouse, on stone step; aluminum tablet stamped "849." (Note 50, p. 130.)

844 Glenford.—*Glenford, Perry Co., Ohio*, 30 feet W. of R. R., SE. corner of abutment of small bridge; aluminum tablet stamped "844." (Note 50, p. 130.)

K.—1.20 miles E. of *Glassrock, Perry Co., Ohio*, SE. corner of stone abutment of bridge; aluminum tablet stamped "826." (Note 50, p. 130.)

L.—*Mount Perry, Perry Co., Ohio*, 254 feet W. of station, NE. corner of covered bridge, on abutment; aluminum tablet stamped "801." (Note 50, p. 130.)

M.—2.31 miles E. of *Mount Perry, Perry Co., Ohio*, 30 feet S. of R. R. on NW. corner of abutment of highway bridge; aluminum tablet stamped "797." (Note 50, p. 130.)

N.—0.1 mile W. of *Fultonham, Muskingum Co., Ohio*, NW. corner of foundation of water trough; aluminum tablet stamped "763." (Note 50, p. 130.)

O.—0.76 mile E. of *White Cottage, Muskingum Co., Ohio*, SE. corner of small bridge, on abutment; aluminum tablet stamped "717." (Note 50, p. 130.)

P.—0.36 mile SW. of *South Zanesville, Muskingum Co., Ohio*, on stone E. of R. R.; aluminum tablet stamped "709." (Note 50, p. 130.)

Q.—*Zanesville, Muskingum Co., Ohio*, S. side of court-house, in top step, 1 foot from building; aluminum tablet stamped "725." (Note 50, p. 130.)

725 Zanesville.—*Zanesville, Muskingum Co., Ohio*, S. side of court-house, 12 feet E. of doorstep, at SW. corner of pillar in top step of portico; aluminum tablet stamped "725." (Note 50, p. 130.)

U. S. E. 2.—*Zanesville, Muskingum Co., Ohio*, on upper wall of lock 10; U. S. Engineer B. M., marked "U. S. B. M. 699.92."

U. S. E. 1.—*Zanesville, Muskingum Co., Ohio*, on upper river wall on S. abutment of Lock No. 10; U. S. Engineer B. M., marked "U. S. B. M. 699.73."

R.—3.94 miles NE. of *Zanesville, Muskingum Co., Ohio*, E. side of concrete culvert, under R. R.; aluminum tablet stamped "778." (Note 50, p. 130.)

S.—*Sonora, Muskingum Co., Ohio*, 40 feet SE. of Baltimore and Ohio station; iron post stamped "808." (Note 51, p. 130.)

T.—1.99 miles NE. of *Sonora, Muskingum Co., Ohio*, on S. side of R. R. on top of concrete culvert, under R. R.; aluminum tablet stamped "778." (Note 50, p. 130.)

U.—4.13 miles NE. of *Sonora, Muskingum Co., Ohio*, on SW. corner of stone foundation of water tank; aluminum tablet stamped "770." (Note 50, p. 130.)

V.—0.02 mile W. of station at *Sundale, Muskingum Co., Ohio*, 30 feet N. of R. R.; iron post stamped "886." (Note 51, p. 130.)

W.—*New Concord, Muskingum Co., Ohio*, 60 feet N. of station; iron post stamped, "843." (Note 51, p. 130.)

X.—In *Guernsey Co.*, 2.70 miles NE. of *New Concord, Muskingum Co., Ohio*, 50 feet S. of R. R., in fence corner; iron post stamped "815." (Note 51, p. 130.)

Y.—*Cassells, Guernsey Co., Ohio*, 60 feet N. of R. R., NE. corner of stone abutment of highway bridge; aluminum tablet stamped "804." (Note 50, p. 130.)

Z.—1.83 miles NE. of *Cassells, Guernsey Co., Ohio*, S. side of R. R. on top of concrete culvert; aluminum tablet stamped "804." (Note 50, p. 130.)

A'.—*Cambridge, Guernsey Co., Ohio*, S. side of court-house, on stone step; aluminum tablet stamped "885." (Note 50, p. 130.)

B'.—2.83 miles N. of *Cambridge, Guernsey Co., Ohio*, NW. corner of stone abutment of R. R. bridge; aluminum tablet stamped "804." (Note 50, p. 130.)

C'.—6.33 miles N. of *Cambridge, Guernsey Co., Ohio*, 20 feet W. of R. R., 10 feet S. of highway; iron post stamped "783." (Note 51, p. 130.)

D'.—9.03 miles N. of *Cambridge, Guernsey Co., Ohio*, 15 feet W. of R. R.; iron post stamped "787." (Note 51, p. 130.)

E'.—*Kimbolton, Guernsey Co., Ohio*, at NW. corner of SW. Luscock barn, on stone; aluminum tablet stamped "787." (Note 50, p. 130.)

G'.—0.02 mile S. of *Birds Run, Guernsey Co., Ohio*, 30 feet W. of R. R., SE. corner of stone abutment of highway bridge; aluminum tablet stamped "770." (Note 50, p. 130.)

H'.—*Guernsey, Guernsey Co., Ohio*, 30 feet W. of R. R., in front of station; iron post stamped "780." (Note 51, p. 130.)

I'.—3.26 miles N. of *Guernsey, Guernsey Co., Ohio*, 25 feet W. of R. R., 10 feet from highway; iron post stamped "828." (Note 51, p. 130.)

J'.—*Newcomerstown, Tuscarawas Co., Ohio*, NW. corner of front steps of Fountain Hotel; aluminum tablet stamped "805." (Note 50, p. 130.)

K'.—3.69 miles E. of *Newcomerstown, Tuscarawas Co., Ohio*, 40 feet N. of R. R.; iron post stamped "804." (Note 51, p. 130.)

L'.—0.12 mile W. of *Port Washington, Tuscarawas Co., Ohio*, at road crossing, 20 feet W. of highway and 30 feet S. of R. R.; iron post stamped "817." (Note 51, p. 130.)

M'.—*Seventeen, Tuscarawas Co., Ohio*, 414 feet N. of R. R. at Lock No. 17, SE. corner of stone abutment; aluminum tablet stamped "834." (Note 50, p. 130.)

N'.—*Gnadenhuttlen, Tuscarawas Co., Ohio*, 35 feet N. of R. R. in front of station; iron post stamped "834." (Note 51, p. 130.)

O'.—0.24 mile E. of *Tuscarawas, Tuscarawas Co., Ohio*, NW. corner of abutment of bridge over highway; aluminum tablet stamped "844." (Note 50, p. 130.)

B. & O. 48.—*Uhrichsville, Tuscarawas Co., Ohio*. (See p. 236.)

P'.—0.52 mile E. of *Uhrichsville, Tuscarawas Co., Ohio*, 3 feet S. of R. R. track, in stone foundation of overhead highway bridge; aluminum tablet stamped "861." (Note 50, p. 130.)

P. R. R.—0.46 mile E. of *Dennison, Tuscarawas Co., Ohio*, on stone abutment of bridge.

868 Steubenville.—*Station 15 P. O., Harrison Co., Ohio*, Pittsburg, Cincinnati, Chicago and St. Louis R. R. (Pennsylvania R. R.) stone bridge No. 86; NE. wing wall, on NE. coping; aluminum tablet stamped "868 Steubenville." (Note 17, p. 127.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN WASHINGTON, D. C., AND BALTIMORE, MD., 1903.

[These descriptions were furnished by the Chief Engineer of the Baltimore and Ohio Railroad. Where necessary, the names of town, county, and State have been added for the purpose of indexing, and in many cases certain information has been condensed into the form of notes. In accordance with railroad usage, the directions in the descriptions as furnished were given according to the general direction of the railroad line. These have been changed to true directions as far as could be determined. In other respects the wording of the original descriptions has not been changed.]

B. & O. 1.—*Washington, D. C.*, cross on top of vertical rail section set opposite milepost W. 2—Baltimore 38.

B. & O. 2.—*Washington, D. C.*, copper bolt set in NW. end of NE. abutment of culvert, SW. end of Trinidad yards, about 50 feet SW. of telegraph pole 37/13.

B. & O. 3.—0.2 mile SW. of *Winthrop Heights, D. C.*, copper bolt set in NE. end of SE. coping of arch culvert opposite telegraph pole 36/16.

B. & O. 4.—150 feet SW. of station at *Langdon, D. C.*, copper bolt set in SW. end of NW. coping of culvert.

B. & O. 5.—*Rives, Prince George Co., Md.*, copper bolt set in NE. end of coping of foundation for overhead bridge; on the SE. side of tracks, and 100 feet SW. of milepost 35.

B. & O. 6.—About  $\frac{1}{2}$  mile SW. of *Hyattsville, Prince George Co., Md.*, copper bolt set in W. corner of SE. cap stone, NE. abutment, bridge 34-A.

B. & O. 7.—*Alexandria Junction, Prince George Co., Md.*, opposite milepost 33. (Note 21, p. 127.)

B. & O. 7A.—About 600 feet N. of *Riverdale, Prince George Co., Md.*, copper bolt set in W. end of N. wall of culvert.

B. & O. 8.—Near *Riverdale, Prince George Co., Md.*, copper bolt set in N. end of E. coping of small culvert, about 400 feet N. of milepost 32.

B. & O. 9.—About  $\frac{1}{2}$  mile N. of *College Park, Prince George Co., Md.*, copper bolt set in W. end of N. abutment of bridge.

B. & O. 9A.—About  $\frac{1}{4}$  mile S. of *Berwyn, Prince George Co., Md.*, copper bolt set in W. end of bridge seat, N. abutment of small bridge at telegraph pole 30/17.

B. & O. 10.— $\frac{1}{4}$  mile N. of *Branchville, Prince George Co., Md.*, copper bolt set in S. end of E. coping of box culvert at telegraph pole 29/24.

B. & O. 11.—About  $\frac{3}{4}$  mile NE. of *Branchville, Prince George Co., Md.*, opposite milepost 29. (Note 21, p. 127.)

B. & O. 12.— $\frac{1}{2}$  mile N. of *Sunnyside, Prince George Co., Md.*, copper bolt set in middle of E. coping of culvert at telegraph pole 27/24.



B. & O. 13.— $\frac{5}{8}$  mile N. of *Beltsville*, *Prince George Co., Md.*, copper bolt set in W. end of bridge seat, N. abutment of bridge at telegraph pole 26/20.

B. & O. 14.—Near *Ammendale*, *Prince George Co., Md.*, opposite milepost 26. (Note 21, p. 127.)

B. & O. 14A.—Near *Muirkirk*, *Prince George Co., Md.*, copper bolt set in middle of S. coping of culvert opposite telegraph pole 25/7.

B. & O. 15.—0.1 mile SW. of *Muirkirk*, *Prince George Co., Md.*, copper bolt set in SW. end of foundation of SE. abutment to overhead bridge at *Muirkirk* furnace.

B. & O. 16.—About 0.4 mile SW. of *Contee*, *Prince George Co., Md.*, opposite milepost 24. (Note 21, p. 127.)

B. & O. 17.—About  $\frac{1}{8}$  mile NE. of *Contee*, *Prince George Co., Md.*, copper bolt set in NW. end of bridge seat, NE. abutment of bridge at telegraph pole 23/11.

B. & O. 17A.—0.2 mile NE. of *Oak Crest*, *Prince George Co., Md.*, copper bolt set in center of SE. coping of culvert at telegraph pole 22/24.

B. & O. 18.— $\frac{1}{2}$  mile SW. of *Laurel*, *Prince George Co., Md.*, copper bolt set in SE. end of NE. abutment of bridge 7, at telegraph pole 21/30.

B. & O. 19.—In *Anne Arundel Co.*, near *Laurel*, *Prince George Co., Md.*, copper bolt set in SE. end of bridge seat NE. abutment of bridge 6.

B. & O. 20.—Near *Savage Station*, about on the line between *Anne Arundel* and *Howard counties*, *Md.*, opposite milepost 20. (Note 21, p. 127.)

B. & O. 21.—0.1 mile E. of *Savage Station*, *Anne Arundel Co., Md.*, copper bolt set in S. end of E. abutment of bridge 5, telegraph pole 19/8.

B. & O. 22.— $\frac{1}{2}$  mile NE. of *Annapolis Junction*, *Howard Co., Md.*, copper bolt set in NE. end of foundation for NW. abutment for overhead bridge.

B. & O. 23.—About  $\frac{1}{2}$  mile S. of *Bridewell*, *Anne Arundel Co., Md.*, opposite milepost 17. (Note 21, p. 127.)

B. & O. 24.—0.1 mile E. of *Bridewell*, *Anne Arundel Co., Md.*, copper bolt set in W. end of N. coping of arch in front of State building.

B. & O. 25.—Near *Jessups*, *Howard Co., Md.*, vertical rail section set opposite milepost 15.

B. & O. 26.—Near *Montevideo*, *Howard Co., Md.*, opposite milepost 14. (Note 21, p. 127.)

B. & O. 27.—0.2 mile E. of *Dorsey*, *Howard Co., Md.*, copper bolt set in SW. end of NW. coping of culvert 400 feet SW. of milepost 13.

B. & O. 28.— $\frac{1}{8}$  mile E. of *Harwood*, *Howard Co., Md.*, copper bolt set in middle of S. coping of arch culvert about 450 feet E. of milepost 12.

B. & O. 29.— $\frac{1}{2}$  mile E. of *Hanover*, *Howard Co., Md.*, opposite milepost 11. (Note 21, p. 127.)

B. & O. 30.— $\frac{1}{4}$  mile SE. of *Elk Ridge*, *Howard Co., Md.*, copper bolt set in coping of retaining wall E. side of tracks, 30 feet S. of milepost 10.

B. & O. 31.—*Relay*, *Baltimore Co., Md.*, copper bolt set in center of top of stone post E. end of viaduct bridge on south side of tracks.

B. & O. 31A.—0.1 mile E. of *St. Denis*, *Baltimore Co., Md.*, copper bolt set in middle of S. coping of arch culvert.

B. & O. 32.—About  $\frac{3}{4}$  mile E. of *St. Denis*, *Baltimore Co., Md.*, copper bolt set in foundation of N. abutment of overhead public road bridge. It is on first course of stone and E. end of abutment of bridge.

B. & O. 33.—0.1 mile E. of *Halethorpe*, *Baltimore Co., Md.*, copper bolt set in S. end of W. wall of culvert, near telegraph pole 5/20.

P. R. R. 101.—780 feet S. of *Winans*, *Baltimore Co., Md.*, shelf cut in E. end of Baltimore and Ohio R. R. bridge.

B. & O. 34.—*Lansdowne*, *Baltimore Co., Md.*, cross on top of vertical rail section opposite milepost 4.

B. & O. 35.— $\frac{1}{2}$  mile N. of *Lansdowne*, *Baltimore Co., Md.*, copper bolt set in large coping stone of retaining wall, S. end of W. abutment of overhead bridge.

B. & O. 36.—*West Baltimore*, *Baltimore Co., Md.* (Note 21, p. 127.)

B. & O. 37.—*Mount Winans*, *Baltimore Co., Md.* (See p. 217.)

B. & O. 38.—Near *Mount Winans*, *Baltimore Co., Md.* (See p. 217.)

B. & O. 39.—*Baltimore, Md.*, corner of *West Ostend* and *Sharp* streets, copper bolt in the middle of the S. coping on the eastern one of two small culverts on the *Locust Point* line of the Baltimore and Ohio R. R., about 500 feet E. of the R. R. junction.

B. & O. 40.—*Baltimore, Md.* (See below.)

City 1288.—*Baltimore, Md.*, at the corner of Howard street and Fifth avenue, copper bolt in step at entrance to Fifth Regiment Armory.

B. & O. 41.—At the Mount Royal Station, *Baltimore, Md.*, copper bolt set on side of tracks in coping of retaining wall between third and fourth bents of train shed from Mount Royal entrance to tunnel.

B. & O. 42.— $\frac{1}{2}$  mile N. of Mount Royal Station, *Baltimore, Md.*, copper bolt in the end of the N. abutment of bridge over Pennsylvania tracks.

B. & O. 43.—*Baltimore, Md.*, copper bolt set in S. end of W. abutment of small bridge about 400 feet W. of milepost 3.

City 1240.—*Baltimore, Md.*, copper bolt set in S. bridge seat of E. abutment of Belt Line R. R. bridge over Jenkins Lane.

#### DESCRIPTIONS OF PERMANENT BENCH MARKS IN BALTIMORE, MD., 1905.

Tidal 1.—*Baltimore, Md.*, on the N. side of Fort McHenry; a cross cut on the top face of the sea wall, at the first angle in the wall, E. of the quartermaster's wharf. Same as Harbor Board's "B. M. Seawall Ft. McHenry."

Tidal 2.—*Baltimore, Md.*, on the N. side of Fort McHenry, a cross cut within a circle, on the top face of the sea wall, in the center of the fourth capstone W. from the quartermaster's wharf.

Tidal 3.—*Baltimore, Md.*, at the SE. corner of the storehouse, S. of the quartermaster's wharf; the highest point of the knob of an old cannon set in the ground with muzzle downward.

Tidal 4.—*Baltimore, Md.*, at Fort McHenry at the intersection of the roads leading to the fort entrance and the quartermaster's wharf; on the corner diagonally opposite the colonel's office; the highest point of the knob of an old cannon set in the ground with muzzle downward.

City 1181.—*Baltimore, Md.*, at the corner of Fort avenue and Towson street, at the Fort Avenue entrance to the Church of Our Lady of Good Counsel; the bottom of a square hole in the W. end of the top step.

L.—*Baltimore, Md.*, at the corner of Randall and Covington streets, at the NE. entrance to Riverside Park; in the top of a large granite gate post on the S. side of the path; the bottom of a square hole close to the corner of the post.

M.—*Baltimore, Md.*, at the corner of Sharp and Ostend streets, on the N. end of the W. one of the two small R. R. culverts; the bottom of a square hole in the top face of the first coping stone (granite) W. of the culvert.

B. & O. 40.—*Baltimore, Md.*, a copper bolt set in the extreme S. end of the eastern offset to the W. retaining wall for the elevated tracks at the approach to Camden Station, about 300 feet from the S. end of the Belt Line cut.

B. & O. 38.—About  $\frac{1}{3}$  of a mile NE. of Mount Winans, *Baltimore Co., Md.*, on the W. abutment of bridge 3A; a copper bolt set vertically in the S. capstone.

B. & O. 37.—*Mount Winans, Baltimore Co., Md.*, near the NE. end of the station platform. (Note 21, p. 127.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN RELAY AND WASHINGTON JUNCTION, MD., 1903.

[These descriptions were furnished by the Chief Engineer of the Baltimore and Ohio Railroad. Where necessary, the names of town, county, and State have been added for the purpose of indexing, and in many cases certain information has been condensed into the form of notes. In accordance with railroad usage, the directions in the descriptions as furnished were given according to the general direction of the railroad line. These have been changed to true directions as far as could be determined. In other respects the wording of the original descriptions has not been changed.]

B. & O. 31.—*Relay, Md.* (See p. 216.)

B. & O. 100.— $\frac{1}{2}$  mile E. of *Relay, Baltimore Co., Md.*, copper bolt set in NW. corner of culvert.

B. & O. 101.—*Vineyard, Baltimore Co., Md.*, copper bolt set in E. end of S. coping of bridge 10.

B. & O. 102.—Near *Vineyard, Baltimore Co., Md.*, copper bolt set in E. end of W. offset of S. coping of bridge.

B. & O. 103.— $\frac{1}{4}$  mile NW. of *Orange Grove, Baltimore Co., Md.*, copper bolt set in native rock on N. side of tracks, 250 feet NW. of mile post 12, and near a large white poplar tree.

B. & O. 104.—*Ilchester, Howard Co., Md.*, copper bolt set between tracks in mud wall of W. abutment of bridge out of Ilchester tunnel.

B. & O. 105.—*Gray, Howard Co., Md.*, opposite milepost 14, on old line. (Note 21, p. 127.)

B. & O. 106.—About 600 feet W. of *Ellicott City, Howard Co., Md.*, copper bolt set in native rock on S. side of tracks.

B. & O. 106A.—About 400 feet E. of *Oella, Howard Co., Md.*, copper bolt set in center of N. coping of arch culvert.

B. & O. 107.— $\frac{3}{4}$  of a mile W. of *Oella, Howard Co., Md.*, copper bolt set in native rock on W. side of tracks, 40 feet S. of telegraph pole 16/10.

B. & O. 108.—About  $1\frac{1}{2}$  miles S. of *Hollofield, Howard Co., Md.*, copper bolt set in SE. corner of W. wing wall of Union dam.

U. S. G. S.— $2\frac{1}{2}$  miles N. of *Ellicott City, Howard Co., Md.*, and about  $1\frac{1}{2}$  miles S. of *Hollofield*; bronze tablet (marked 187) set in SE. corner of W. wing wall of Union dam. (Note 17, p. 127.)

B. & O. 109.—Near *Hollofield, Howard Co., Md.*, copper bolt set in E. coping of culvert, 125 feet N. of milepost 18, 6 feet from S. end of coping.

B. & O. 110.—*Hollofield, Howard Co., Md.*, copper bolt set in N. end of E. coping of culvert near target at tower.

B. & O. 111.—About  $\frac{3}{4}$  mile NW. of *Hollofield, Howard Co., Md.*, copper bolt set in large rock, S. side of tracks telegraph pole 19/34.

B. & O. 112.—In Baltimore Co., about 0.2 mile west of *Alborton, Howard Co., Md.*, copper bolt set between tracks, W. abutment of bridge 17.

B. & O. 113.—Near *Alborton, Howard Co., Md.*, copper bolt set in center of SE. coping of arch culvert, at Dorseys Run.

B. & O. 114.—Near *Alborton, Howard Co., Md.*,  $\frac{3}{8}$  mile W. of Dorseys Run, copper bolt set in center of N. coping of arch culvert 21.

B. & O. 115.—Near *Davis, Howard Co., Md.*, 1 mile W. of Dorseys Run, copper bolt set in center of N. coping of arch culvert 22.

B. & O. 116.—*Davis, Howard Co., Md.*, copper bolt set in center of W. coping of arch culvert 23.

B. & O. 117.—About 500 feet E. of *Woodstock, Howard Co., Md.*, copper bolt set in S. end of small culvert.

B. & O. 118.—Near *Woodstock, Howard Co., Md.*, at milepost 26. (Note 21, p. 127.)

B. & O. 119.—Near *Marriottsville*, about 2 miles NW. of *Woodstock, Howard Co., Md.*, copper bolt set in retaining wall on E. side of tracks, 20 feet W. of telegraph pole 26/28.

B. & O. 120.—*Marriottsville, Howard Co., Md.*, copper bolt set in N. end of W. mud wall of bridge 25.

B. & O. 121.—Near *Henryton, Carroll Co., Md.*, 300 feet E. of Henryton tunnel, copper bolt set between tracks, bridge seat of W. abutment of bridge 26.

B. & O. 122.—Near *Gorsuch, Carroll Co., Md.*, copper bolt set in N. end of small box culvert, 100 feet W. of milepost 29.

B. & O. 123.—*Gorsuch, Carroll Co., Md.*, copper bolt set in N. end of W. abutment of culvert 27.

B. & O. 124.—Near *Sykesville, Carroll Co., Md.*, opposite milepost 31. (Note 21, p. 127.)

B. & O. 125.—100 feet W. of station at *Sykesville, Carroll Co., Md.*, copper bolt set in center of S. coping of culvert.

B. & O. 126.—Near *Gaither, Carroll Co., Md.*, copper bolt set between tracks in bridge seat of of bridge at W. end of Sykesville tunnel.

B. & O. 127.— $\frac{1}{4}$  mile SW. of *Gaither, Carroll Co., Md.*, copper bolt set in N. end of W. abutment of bridge 28.

B. & O. 128.—Near *Hoods Mill, Carroll Co., Md.*, copper bolt set in S. end of small culvert, 100 feet W. of milepost 34.

B. & O. 129.—At dam at *Hoods Mill, Carroll Co., Md.*, copper bolt set in large rock on S. side of tracks.

B. & O. 130.—Near *Morgan, Carroll Co., Md.*, opposite milepost 36. (Note 21, p. 127.)

B. & O. 131.—Near *Woodbine, Carroll Co., Md.*, opposite milepost 37. (Note 21, p. 127.)

B. & O. 131A.—About 300 feet W. of *Woodbine, Carroll Co., Md.*, copper bolt set in NE. corner small culvert.

B. & O. 132.—Near *Woodbine, Carroll Co., Md.*, opposite milepost 38. (Note 21, p. 127.)

B. & O. 133.—Near *Watersville, Carroll Co., Md.*, copper bolt set between tracks in bridge seat of E. abutment of bridge at E. end of Mount Airy cut-off.

B. & O. 134.—About  $\frac{1}{4}$  mile W. of *Watersville, Carroll Co., Md.*, copper bolt set in N. coping of culvert on Mount Airy cut-off.

B. & O. 135.—About 1 mile W. of *Watersville, Carroll Co., Md.*, copper bolt set in W. end of S. coping of culvert at E. end of cut on Mount Airy cut-off.

B. & O. 136.—Near *Watersville, Carroll Co., Md.*, at E. end of Mount Airy tunnel. (Note 21, p. 127.)

B. & O. 136A.—In *Frederick Co.*, near *Watersville, Carroll Co., Md.*, at W. end of Mount Airy tunnel. (Note 21, p. 127.)

B. & O. 137.—Near *Plane No. 4, Frederick Co., Md.*,  $\frac{1}{4}$  mile E. of *Mount Airy Junction*, copper bolt on E. end of S. coping of culvert,  $\frac{1}{2}$  mile W. of Mount Airy tunnel.

B. & O. 138.—250 feet E. of *Plane No. 4, Frederick Co., Md.*, copper bolt set in E. end of N. coping of arch.

B. & O. 139.— $\frac{1}{8}$  mile E. of *Bartholows, Frederick Co., Md.*, copper bolt set in E. end of small culvert on S. side of tracks, 500 feet W. of milepost 47.

B. & O. 140.—300 feet W. of *Bartholows, Frederick Co., Md.*, copper bolt set in W. end of N. coping of arch road crossing.

B. & O. 141.—Near *Monrovia, Frederick Co., Md.*, copper bolt set in N. end of small culvert, about 400 feet W. of crossing of old and new tracks.

B. & O. 142.—Near *Monrovia, Frederick Co., Md.*, opposite milepost 49. (Note 21, p. 127.)

B. & O. 143.—300 feet W. of *Monrovia, Frederick Co., Md.*, copper bolt set between tracks, E. bridge seat.

B. & O. 144.—Near *Monrovia, Frederick Co., Md.*, copper bolt in N. end of E. bridge seat of bridge, 40 feet E. of milepost 51.

B. & O. 145.—Near *Monrovia, Frederick Co., Md.*, copper bolt set in center of N. coping of arch culvert, telegraph pole 51/23.

B. & O. 146.—Near *Ijamsville, Frederick Co., Md.*, copper bolt N. end of small culvert, 20 feet E. of telegraph pole 52/19.

B. & O. 147.—Near *Ijamsville, Frederick Co., Md.*, opposite milepost 53. (Note 21, p. 127.)

B. & O. 148.—About  $\frac{3}{4}$  mile W. of *Ijamsville, Frederick Co., Md.*, copper bolt set between tracks, E. bridge seat of bridge near milepost 54.

B. & O. 149.—Near *Ijamsville, Frederick Co., Md.*, copper bolt set between tracks in W. bridge seat of new bridge at W. end of *Ijamsville* tunnel.

B. & O. 150.—1 mile E. of *Reels Mill, Frederick Co., Md.*, copper bolt set between tracks in W. bridge seat of bridge.

B. & O. 151.—*Reels Mill, Frederick Co., Md.*, copper bolt set in foundation stone, SW. corner coal chute.

B. & O. 152.—*Frederick Junction, Frederick Co., Md.*, copper bolt set in N. end of mud wall of E. abutment of *Monocacy River* bridge.

B. & O. 152A.—About 1 mile from *Frederick Junction, Frederick Co., Md.*, copper bolt S. end of W. coping of culvert.

B. & O. 152B.—About  $1\frac{3}{4}$  miles from *Frederick, Frederick Co., Md.*, copper bolt set in outcropping limestone, E. side of track, seven telegraph poles S. of milepost *Frederick 2*, at N. end of cut.

B. & O. 152C.—About 300 feet S. of station at *Frederick, Frederick Co., Md.*, copper bolt set in native rock W. of tracks.

B. & O. 153.—About 1 mile W. of *Frederick Junction, Frederick Co., Md.*, copper bolt set in W. end of S. coping of culvert, 50 feet E. of telegraph pole 58/34.

B. & O. 153A.— $1\frac{1}{2}$  miles W. of *Frederick Junction, Frederick Co., Md.*, copper bolt set in W. end of N. coping of culvert 36.

B. & O. 154.—Near *Lime Kiln, Frederick Co., Md.*, opposite milepost 60. (Note 21, p. 127.)

B. & O. 155.— $\frac{1}{2}$  mile W. of *Lime Kiln, Frederick Co., Md.*, opposite milepost 61. (Note 21, p. 127.)

B. & O. 156.—0.3 mile E. of *Buckeystown Station, Frederick Co., Md.*, opposite milepost 62. (Note 21, p. 127.)

B. & O. 156A.—*Buckeystown Station, Frederick Co., Md.*, copper bolt set in W. end of N. coping of culvert.

B. & O. 157.—Near *Buckeystown, Frederick Co., Md.*, opposite milepost 63. (Note 21, p. 127.)

- B. & O. 158.— $\frac{1}{4}$  mile E. of *Adamstown, Frederick Co., Md.*, opposite milepost 64. (Note 21, p. 127.)
- B. & O. 159.—500 feet E. of *Doubs, Frederick Co., Md.*, copper bolt set in center of N. coping of culvert  $36\frac{1}{2}$ , about 275 feet W. of milepost 65.
- B. & O. 160.—Near *Doubs, Frederick Co., Md.*, copper bolt set in W. cap stone of S. coping of arch culvert, about 300 feet W. of milepost 66.
- B. & O. 161.—Near *Washington Junction, Frederick Co., Md.*, opposite milepost 67. (Note 21, p. 127.)
- B. & O. 162.—About  $\frac{3}{4}$  mile E. of *Washington Junction, Frederick Co., Md.*, opposite milepost 68. (Note 21, p. 127.)
- B. & O. 163.—Near *Adamstown, Frederick Co., Md.*, copper bolt set in E. end of N. coping of culvert at E. end of first cut from Adamstown, on the Adamstown cut-off, not far from Doubs.
- B. & O. 164.—2 miles from *Doubs, Frederick Co., Md.*, on the Adamstown cut-off; copper bolt set in S. end of W. coping of small culvert, 1 000 feet S. of large arch culvert.
- B. & O. 165.—About  $1\frac{1}{2}$  miles from *Washington Junction, Frederick Co., Md.*, on the Adamstown cut-off; copper bolt set in N. end of W. coping of culvert at N. end of first large cut from Metropolitan branch.
- B. & O. 44.—*Washington Junction, Frederick Co., Md.*, vertical rail section set on S. side of tracks, about 150 feet E. of old signal tower.

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN FOLEY, PA., AND STRUTHERS, OHIO, 1903.

[These descriptions were furnished by the Chief Engineer of the Baltimore and Ohio Railroad. Where necessary, the names of town, county, and State have been added for the purpose of indexing, and in many cases certain information has been condensed into the form of notes. In accordance with railroad usage, the directions in the descriptions as furnished were given according to the general direction of the railroad line. These have been changed to true directions as far as could be determined. In other respects the wording of the original descriptions has not been changed.]

- B. & O. 176.—*Foley, Pa.* (See App. 3, Report for 1903, p. 738.)
- B. & O. 177.—*Glencoe, Somerset Co., Pa.*, SW. corner of S. end of E. abutment of bridge 23.
- B. & O. 178.— $\frac{3}{8}$  mile W. of *Glencoe, Somerset Co., Pa.*, copper bolt set in native rock, S. side of tracks, 50 feet W. of telegraph pole 201/35.
- B. & O. 179.— $1\frac{1}{2}$  miles SW. of *Glencoe, Somerset Co., Pa.*, copper bolt set between tracks in mud wall of NE. abutment of bridge 25, 50 feet SW. of telegraph pole 202/25.
- B. & O. 180.—*Philson, Somerset Co., Pa.*, opposite W. end of station platform. (Note 28, p. 128.)
- B. & O. 181.— $1\frac{1}{4}$  miles NW. of *Philson, Somerset Co., Pa.*, copper bolt set in native rock, S. side of tracks, about 40 feet from tracks and about 40 feet W. of watch box.
- B. & O. 182.— $2\frac{1}{2}$  miles NW. of *Philson, Somerset Co., Pa.*, at telegraph pole 206/20. (Note 29, p. 128.)
- B. & O. 182A.—1 mile SE. of *Mance, Somerset Co., Pa.*, at telegraph pole 206/27. (Note 28, p. 128.)
- B. & O. 183.— $\frac{1}{3}$  mile SE. of *Mance, Somerset Co., Pa.*, opposite telegraph pole 207/26. (Note 29, p. 128.)
- B. & O. 184.— $\frac{2}{3}$  mile W. of *Mance, Somerset Co., Pa.*, near center of first cut W. of Mance Station, nearly opposite end of cut on S. side of tracks. (Note 28, p. 128.)
- B. & O. 185.—2 miles SW. of *Mance, Somerset Co., Pa.*, copper bolt set in rock in place on SE. side of tracks, 125 feet NE. of NE. portal of Sand Patch tunnel.
- B. & O. 186.—1 mile NE. of *Sand Patch, Somerset Co., Pa.*, at summit SW. end of Sand Patch tunnel. (Note 28, p. 128.)
- B. & O. 187.—*Sand Patch, Somerset Co., Pa.*, rail section set between first and second sidings, about 150 feet NE. of tower, 50 feet NE. of milepost 211.
- B. & O. 188.—375 feet NW. of *Keystone, Somerset Co., Pa.* (Note 28, p. 128.)
- B. & O. 189.—1 mile SE. of *Meyersdale, Somerset Co., Pa.*, 30 feet E. of telegraph pole 213/30. (Note 28, p. 128.)
- B. & O. 190.—*Meyersdale, Somerset Co., Pa.*, vertical rail section on NE. side of tracks at SE. end of platform.
- B. & O. 191.— $\frac{1}{4}$  mile SE. of *Salisbury Junction, Somerset Co., Pa.*, opposite milepost 216. (Note 21, p. 127.)
- B. & O. 192.— $\frac{3}{4}$  mile NW. of *Salisbury Junction, Somerset Co., Pa.*, copper bolt SW. end of mud wall, SE. abutment of bridge 26.
- B. & O. 193.—2 miles SE. of *Garrett, Somerset Co., Pa.*, opposite milepost 218. (Note 21, p. 127.)

- B. & O. 194.— $\frac{3}{4}$  mile SE. of *Garrett, Somerset Co., Pa.*, copper bolt set in SW. end of mud wall, SE. abutment of bridge 28.
- B. & O. 195.— $\frac{1}{4}$  mile SE. of *Garrett, Somerset Co., Pa.*, copper bolt set in SW. end of SE. abutment of bridge 29.
- B. & O. 196.— $\frac{3}{4}$  mile NW. of *Garrett, Somerset Co., Pa.*, on bridge 30. (Note 30, p. 128.)
- B. & O. 197.— $1\frac{1}{2}$  miles NW. of *Garrett, Somerset Co., Pa.*, on bridge 34. (Note 30, p. 128.)
- B. & O. 198.—*McSpadden, Somerset Co., Pa.*, opposite tower. (Note 21, p. 127.)
- B. & O. 199.— $\frac{3}{4}$  mile NW. of *McSpadden, Somerset Co., Pa.*, copper bolt set in large boulder on N. side of tracks.
- B. & O. 200.—2 miles SE. of *Rockwood, Somerset Co., Pa.*, copper bolt set in SW. end of bridge seat of SE. abutment of bridge 32.
- B. & O. 201.— $\frac{3}{4}$  mile SE. of *Rockwood, Somerset Co., Pa.*, opposite milepost 226. (Note 21, p. 127.)
- B. & O. 202.—*Rockwood, Somerset Co., Pa.*, copper bolt set in S. end of mud wall, E. abutment of bridge 34.
- B. & O. 203.— $1\frac{1}{4}$  miles SW. of *Rockwood, Somerset Co., Pa.*, copper bolt set in SE. end of mud wall of NE. abutment of bridge 35.
- B. & O. 204.— $2\frac{1}{4}$  miles SW. of *Rockwood, Somerset Co., Pa.*, 125 feet W. of milepost 229. (Note 28, p. 128.)
- B. & O. 205.—1 mile N. of *Casselman, Somerset Co., Pa.*, copper bolt set between tracks in mud wall of NE. abutment of bridge 36.
- B. & O. 206.—500 feet SW. of station at *Casselman, Somerset Co., Pa.*, copper bolt set in SE. corner of coping of culvert.
- B. & O. 207.— $1\frac{1}{4}$  miles SW. of station at *Casselman, Somerset Co., Pa.*, copper bolt set in SE. end of bridge seat of NE. abutment of bridge 38.
- B. & O. 208.— $\frac{3}{4}$  mile N. of *Markleton, Somerset Co., Pa.*, opposite milepost 233. (Note 21, p. 127.)
- B. & O. 209.—*Markleton, Somerset Co., Pa.* (Note 21, p. 127.)
- B. & O. 210.—*Pinkerton, Somerset Co., Pa.*, copper bolt set in NE. pedestal of water tank.
- B. & O. 211.— $1\frac{1}{2}$  miles SW. of *Pinkerton, Somerset Co., Pa.*, copper bolt set in foundation NE. portal Shoo Fly tunnel, SE. side of the tracks.
- B. & O. 212.—*Fort Hill, Somerset Co., Pa.*, shelf on E. end of S. coping of arch.
- B. & O. 213.— $1\frac{1}{4}$  miles SW. of *Fort Hill, Somerset Co., Pa.*, copper bolt set in water shelf, E. portal of Brook tunnel, S. side of tracks.
- B. & O. 214.— $2\frac{1}{4}$  miles W. of *Fort Hill, Somerset Co., Pa.*, at milepost 238. (Note 29, p. 128.)
- B. & O. 215.— $\frac{1}{2}$  mile NE. of station at *Ursina, Somerset Co., Pa.*, at milepost 239. (Note 28, p. 128.)
- B. & O. 216.— $1\frac{1}{4}$  miles E. of *Confluence, Somerset Co., Pa.*, at milepost 240. (Note 29, p. 128.)
- B. & O. 217.—*Confluence, Somerset Co., Pa.*, copper bolt set in S. end of E. abutment of bridge 42.
- B. & O. 218.— $1\frac{1}{2}$  miles NW. of *Confluence, Somerset Co., Pa.*, copper bolt set in SE. end of SW. coping of arch culvert 43.
- B. & O. 219.— $2\frac{3}{5}$  miles NW. of *Confluence, Somerset Co., Pa.*, on culvert 44 at tank 8. (Note 33, p. 128.)
- B. & O. 220.—In *Somerset Co.*,  $1\frac{1}{5}$  miles SE. of *Bidwell, Fayette Co., Pa.*, about 100 feet SE. of milepost 247. (Note 28, p. 128.)
- B. & O. 221.—*Bidwell, Fayette Co., Pa.*, copper bolt set in E. end of S. coping of arch culvert 45.
- B. & O. 222.—1 mile W. of *Bidwell, Fayette Co., Pa.*, at milepost 249. (Note 21, p. 127.)
- B. & O. 223.— $\frac{1}{4}$  mile E. of station at *Sipes, Fayette Co., Pa.*, near milepost 250. (Note 28, p. 128.)
- B. & O. 224.— $1\frac{1}{2}$  miles SW. of *Sipes, Fayette Co., Pa.*, copper bolt set in base of signal,  $\frac{1}{4}$  mile E. of H. K. tower.
- B. & O. 225.— $\frac{3}{4}$  mile S. of *Ohio pyle, Fayette Co., Pa.*, on small culvert  $\frac{1}{4}$  mile NW. of H. K. tower. (Note 32, p. 128.)
- B. & O. 226.— $\frac{1}{2}$  mile NE. of *Ohio pyle, Fayette Co., Pa.*, and 200 feet SW. of borrow pit. (Note 28, p. 128.)
- B. & O. 227.—1 mile SE. of *Bear Run, Fayette Co., Pa.*, copper bolt set in E. end of masonry over 36-inch pipe culvert,  $\frac{1}{2}$  mile N. of tank 9.
- B. & O. 228.—400 feet NW. of station at *Bear Run, Fayette Co., Pa.*, copper bolt set in large rock on SW. side of tracks.

- B. & O. 229.— $1\frac{1}{4}$  miles NW. of *Bear Run, Fayette Co., Pa.*, copper bolt set in a small rock, W. side of tracks,  $\frac{1}{2}$  mile N. of milepost 257.
- B. & O. 230.— $\frac{1}{2}$  mile S. of *Stewarton, Fayette Co., Pa.*, copper bolt set in rock on W. side of tracks,  $\frac{1}{3}$  mile N. of Yough tower and at beginning of first cut N. of same.
- B. & O. 231.— $\frac{1}{2}$  mile N. of *Stewarton, Fayette Co., Pa.*, 50 feet N. of watch box. (Note 28, p. 128.)
- B. & O. 232.— $1\frac{1}{2}$  miles N. of *Stewarton, Fayette Co., Pa.*, 500 feet N. of milepost 260. (Note 28, p. 128.)
- B. & O. 233.— $1\frac{1}{2}$  miles SE. of *Indian Creek, Fayette Co., Pa.*, 8 telegraph poles NW. of watch box. (Note 28, p. 128.)
- B. & O. 234.—*Indian Creek, Fayette Co., Pa.*, on bridge 46. (Note 33, p. 128.)
- U. S. G. S.—*Indian Creek, Fayette Co., Pa.*, on S. bridge seat, W. abutment of Baltimore and Ohio R. R. bridge over Indian Creek. (Note 17, p. 127.)
- B. & O. 235.— $1\frac{1}{3}$  miles W. of *Indian Creek, Fayette Co., Pa.*, opposite milepost 264. (Note 28, p. 128.)
- B. & O. 236.— $2\frac{1}{3}$  miles W. of *Indian Creek, Fayette Co., Pa.*, 200 feet W. of milepost 265. (Note 28, p. 128.)
- B. & O. 237.— $3\frac{1}{3}$  miles W. of *Indian Creek, Fayette Co., Pa.*, copper bolt set in small loose sandstone boulder, N. side of tracks, opposite milepost 266.
- B. & O. 238.— $4\frac{1}{3}$  miles W. of *Indian Creek, Fayette Co., Pa.*, 1 telegraph pole SE. of milepost 267. (Note 28, p. 128.)
- B. & O. 239.—Near *South Connellsville, Fayette Co., Pa.*, copper bolt set in S. end of E. abutment of new F. M. & P. R. R. bridge, S. of Connellsville yards.
- B. & O. 240.—*Connellsville, Fayette Co., Pa.*, 0.2 mile N. of roundhouse, on bridge 49. (Note 33, p. 128.)
- B. & O. 240A.—*Connellsville, Fayette Co., Pa.*, United States Geological Survey B. M. marked 885; bolt set in S. end of pier of highway bridge between R. R. tracks.
- B. & O. 241.—0.3 mile NW. of *Connellsville, Fayette Co., Pa.*, copper bolt set in NE. end of NW. end of bridge 51.
- B. & O. 242.—1 mile NW. of *Connellsville, Fayette Co., Pa.*, copper bolt set in the NE. end of cement pier to overhead main bridge, on NW. side of tracks.
- B. & O. 243.— $\frac{1}{2}$  mile SE. of *Broad Ford Junction, Fayette Co., Pa.*, at the watch box. (Note 21, p. 127.)
- B. & O. 244.—*Broad Ford, Fayette Co., Pa.*, copper bolt set in E. corner stone of S. abutment of overhead Pittsburg and Lake Erie R. R. bridge.
- B. & O. 245.— $1\frac{1}{4}$  miles W. of *Broad Ford, Fayette Co., Pa.*, opposite milepost 274. (Note 21, p. 127.)
- B. & O. 246.— $2\frac{1}{4}$  miles W. of *Broad Ford, Fayette Co., Pa.*, opposite milepost 275. (Note 21, p. 127.)
- B. & O. 246A.— $\frac{1}{2}$  mile SE. of *Dawson, Fayette Co., Pa.*, copper bolt set in SW. end of bridge seat, SE. abutment of bridge 53.
- B. & O. 247.— $\frac{1}{2}$  mile NW. of *Dawson, Fayette Co., Pa.*, copper bolt set in center of SW. coping of arch.
- B. & O. 248.—About 2 miles NW. of *Dawson, Fayette Co., Pa.*, copper bolt set in S. end of bridge seat of W. abutment of bridge 54.
- B. & O. 249.— $2\frac{1}{2}$  miles NW. of *Dawson, Fayette Co., Pa.*, at milepost 278. (Note 21, p. 127.)
- B. & O. 250.— $\frac{3}{8}$  mile E. of station at *Lavenia, Fayette Co., Pa.*, opposite milepost 279. (Note 21, p. 127.)
- B. & O. 251.—100 feet SE. of station at *Lavenia, Fayette Co., Pa.*, copper bolt set in large rock on the SW. side of the tracks.
- B. & O. 253.—1 mile SE. of *Layton, Fayette Co., Pa.*, point on large rock on NW. side of the tracks at stone and sand works, 2 telegraph poles SW. of milepost 282.
- B. & O. 254.—*Layton, Fayette Co., Pa.*, at milepost 283. (Note 21, p. 127.)
- B. & O. 255.—1 mile NW. station at *Layton, Fayette Co., Pa.*, copper bolt set in SE. pedestal of water tank.
- B. & O. 256.—2 miles NW. of *Layton, Fayette Co., Pa.*, opposite milepost 285. (Note 21, p. 127.)
- B. & O. 257.— $\frac{1}{4}$  mile SW. of *Banning, Fayette Co., Pa.*, opposite milepost 286. (Note 21, p. 127.)

B. & O. 258.— $\frac{1}{4}$  mile S. of *Jacobs Creek*, *Westmoreland Co., Pa.*, copper bolt set in W. end of mud wall of S. abutment of bridge 55.

B. & O. 259.—About 1 000 feet S. of *Eureka*, *Westmoreland Co., Pa.*, opposite milepost 288. (Note 21, p. 127.)

B. & O. 260.—*Smithton*, *Westmoreland Co., Pa.*, copper bolt set in S. end of bridge seat of E. abutment of highway bridge.

B. & O. 261.— $\frac{3}{4}$  mile SE. of *Port Royal*, *Westmoreland Co., Pa.*, at milepost 290. (Note 21, p. 127.)

B. & O. 262.—0.2 mile N. of *Port Royal*, *Westmoreland Co., Pa.*, opposite milepost 291. (Note 21, p. 127.)

B. & O. 263.—0.3 mile SW. of *Reduction*, *Westmoreland Co., Pa.*, opposite milepost 292. (Note 21, p. 127.)

B. & O. 264.— $\frac{3}{4}$  mile NE. of *Reduction*, *Westmoreland Co., Pa.*, opposite milepost 293. (Note 21, p. 127.)

B. & O. 264A.—*Griffin*, *Westmoreland Co., Pa.*, copper bolt set in S. end of E. coping of arch culvert, 1 000 feet N. of tank 14.

B. & O. 265.— $\frac{3}{4}$  mile SE. of *West Newton*, *Westmoreland Co., Pa.*, opposite milepost 294. (Note 21, p. 127.)

B. & O. 266.—250 feet N. of station at *West Newton*, *Westmoreland Co., Pa.*, opposite milepost 295. (Note 21, p. 127.)

B. & O. 266A.—Near *West Newton*, *Westmoreland Co., Pa.*, copper bolt set in E. side of lower circle of masonry of turntable.

B. & O. 267.—1 mile N. of *West Newton*, *Westmoreland Co., Pa.*, opposite milepost 296. (Note 21, p. 127.)

B. & O. 268.—0.1 mile E. of *Grazztown*, *Westmoreland Co., Pa.*, copper bolt set in S. end of bridge seat of E. abutment of twin bridges at milepost 297.

B. & O. 269.—1 mile W. of *Grazztown*, *Westmoreland Co., Pa.*, at milepost 298. (Note 21, p. 127.)

B. & O. 270.—*Suter*, *Westmoreland Co., Pa.*, copper bolt set in SW. end of bridge seat of NW. abutment of bridge 57.

B. & O. 271.— $\frac{1}{4}$  mile SW. of *Scott Haven*, *Westmoreland Co., Pa.*, opposite milepost 300. (Note 21, p. 127.)

B. & O. 273.—*Vista*, *Westmoreland Co., Pa.*, opposite milepost 302. (Note 21, p. 127.)

B. & O. 274.—300 feet NE. of *Shaner*, *Westmoreland Co., Pa.*, opposite milepost 303. (Note 21, p. 127.)

B. & O. 275.—*Guffey*, *Westmoreland Co., Pa.*, copper bolt set in W. end of bridge seat of N. abutment of bridge 58.

B. & O. 276.— $\frac{3}{4}$  mile E. of *Coulter*, *Allegheny Co., Pa.*, opposite milepost 305. (Note 21, p. 127.)

B. & O. 277.— $\frac{1}{4}$  mile N. of *Coulter*, *Allegheny Co., Pa.*, opposite milepost 306. (Note 21, p. 127.)

B. & O. 278.— $1\frac{1}{4}$  miles NE. of *Coulter*, *Allegheny Co., Pa.*, opposite mile post 307. (Note 21, p. 127.)

B. & O. 279.— $2\frac{1}{4}$  miles N. of *Coulter*, *Allegheny Co., Pa.*, opposite section post 29/30. (Note 21, p. 127.)

B. & O. 280.— $1\frac{1}{4}$  miles E. of *Versailles*, *Allegheny Co., Pa.*, opposite milepost 309. (Note 21, p. 127.)

B. & O. 280A.— $\frac{1}{2}$  mile SE. of *Versailles*, *Allegheny Co., Pa.*, copper bolt set in E. end of bridge seat of pier S. of tracks of the overhead highway bridge.

B. & O. 281.—*Versailles*, *Allegheny Co., Pa.*, copper bolt set in lower circle of masonry of turntable, opposite E. approach.

B. & O. 282.— $\frac{1}{2}$  mile SE. of *Christy Park*, *Allegheny Co., Pa.*, opposite milepost 311. (Note 21, p. 127.)

B. & O. 283.— $1\frac{1}{8}$  miles S. of *McKeesport*, *Allegheny Co., Pa.*, opposite milepost 312. (Note 21, p. 127.)

B. & O. 284.— $\frac{1}{8}$  mile S. of *McKeesport*, *Allegheny Co., Pa.*, opposite milepost 313. (Note 21, p. 127.)

B. & O. 285.— $\frac{3}{4}$  mile E. of *McKeesport*, *Allegheny Co., Pa.*, copper bolt set in N. pedestal of the overhead street-car bridge, 200 feet E. of milepost 314.

B. & O. 286.—*Demmler*, *Allegheny Co., Pa.*, opposite milepost 315. (Note 21, p. 127.)



B. & O. 287.— $1\frac{1}{4}$  miles SE. of *Bessemer, Allegheny Co., Pa.*, at milepost 316, between main tracks. (Note 21, p. 127.)

B. & O. 287A.— $\frac{3}{4}$  mile SE. of *Bessemer, Allegheny Co., Pa.*, on bridge 63. (Note 30, p. 128.)

B. & O. 288.—100 feet SE. of *Bessemer, Allegheny Co., Pa.*, copper bolt set in W. pedestal of bent N. of tracks of Union R. R. overhead crossing.

B. & O. 289.— $\frac{1}{4}$  mile SE. of *Braddock, Allegheny Co., Pa.*, opposite milepost 318. (Note 21, p. 127.)

B. & O. 290.—100 feet NW. of *Rankin, Allegheny Co., Pa.*; copper bolt set in north pedestal of bent for overhead bridge, 50 feet SW. of tracks.

B. & O. 291.—0.9 mile NW. of *Rankin, Allegheny Co., Pa.*, opposite milepost 320. (Note 21, p. 127.)

B. & O. 292.— $\frac{1}{2}$  mile NE. of *Highland, Allegheny Co., Pa.*, opposite milepost 321. (Note 21, p. 127.)

B. & O. 292A.—*Highland, Allegheny Co., Pa.*; copper bolt set in NW. end of SW. pier of bridge 66.

B. & O. 293.—*Wheeling Junction, Allegheny Co., Pa.*; copper bolt set in the lower step of E. end of concrete abutment of overhead bridge.

B. & O. 294.—0.3 mile N. of *Glenwood, Allegheny Co., Pa.*; copper bolt set in N. pedestal of bent of overhead bridge.

B. & O. 295.—*Marion Junction, Allegheny Co., Pa.*; copper bolt set between main tracks in SE. wall of small culvert.

B. & O. 296.—*Laughlin Junction, Allegheny Co., Pa.*; copper bolt set in bridge seat of NW. abutment of bridge 67, just NE. of the tracks to Pittsburgh.

B. & O. 297.—*Pittsburg, Allegheny Co., Pa.*; copper bolt set in SE. corner of bridge over Maurice street, 1 000 feet W. of milepost 326.

B. & O. 298.—*Pittsburg, Allegheny Co., Pa.*, on pier of bridge directly under Brady Street river bridge. (Note 30, p. 128.)

B. & O. 299.—*Pittsburg, Allegheny Co., Pa.*; copper bolt set in bridge seat W. abutment of railroad bridge over Second avenue.

B. & O. 300.—*Pittsburg, Allegheny Co., Pa.*; copper bolt set in SW. end of the retaining wall, NW. side of the tracks at SW. end of train shed.

B. & O. 301.—0.3 mile N. of *Laughlin Junction, Allegheny Co., Pa.*, on viaduct bridge. (Note 31, p. 128.)

B. & O. 302.—1 mile N. of *Laughlin Junction, Allegheny Co., Pa.*, opposite milepost Laughlin Junction 1. (Note 21, p. 127.)

B. & O. 303.— $1\frac{3}{4}$  miles N. of *Laughlin Junction, Allegheny Co., Pa.*, copper bolt E. of tracks, set in foundation of portal of Pittsburgh Junction tunnel.

B. & O. 304.— $2\frac{1}{2}$  miles N. of *Laughlin Junction, Allegheny Co., Pa.*, copper bolt E. of tracks, set in foundation at end of Pittsburgh Junction tunnel.

B. & O. 305.— $2\frac{3}{4}$  miles N. of *Laughlin Junction, Allegheny Co., Pa.*, copper bolt set in S. end of W. abutment of Pennsylvania R. R. overhead bridge.

818 Pittsburgh.—*Benvenue, Allegheny Co., Pa.* (See App. 9, Report for 1899, p. 868.)

B. & O. 306.—*Pittsburg, Allegheny Co., Pa.*, about  $\frac{1}{2}$  mile from Allegheny River; copper bolt set in W. pedestal of first bent N. of pier N. of tracks of overhead highway bridge 33.

P. R. R.—*Lawrenceville, Allegheny Co., Pa.*, shelf W. end of S. abutment of Third Street bridge.

B. & O. 306A.—*Pittsburg, Allegheny Co., Pa.*, copper bolt set in S. end of E. shore pier of Allegheny River bridge.

B. & O. 307.—Near *Pittsburg, Allegheny Co., Pa.*, copper bolt set in NE. end of mud wall of SE. abutment of backwater bridge, Herrs Island.

B. & O. 308A.—*Allegheny, Allegheny Co., Pa.*,  $1\frac{1}{5}$  miles NE. of the P. & W. R. R. station; copper bolt set in SW. coping of NW. abutment of Thirtieth Street river bridge.

B. & O. 308B.—*Allegheny, Allegheny Co., Pa.*,  $\frac{1}{4}$  mile E. of the P. & W. R. R. station; copper bolt set in W. end of coping to retaining wall, Sixteenth Street river bridge.

B. & O. 308C.—*Allegheny, Allegheny Co., Pa.*, 600 feet W. of the P. & W. R. R. station; copper bolt set in NW. end of pier between railroad tracks of Eighth Street river bridge.

B. & O. 308D.—*Allegheny, Allegheny Co., Pa.*,  $\frac{3}{4}$  mile NW. of the P. & W. R. R. station; copper bolt set in E. end of N. abutment of Point bridge.

B. & O. 310.— $\frac{3}{4}$  mile SW. of *Sharpsburg, Allegheny Co., Pa.*, Pennsylvania R. R. B. M. 5, West Penn R. R.; copper bolt set in N. end of W. abutment Pennsylvania R. R. bridge over Pine Creek.

B. & O. 310A.—0.3 mile W. of *Sharpsburg, Allegheny Co., Pa.*, copper bolt set between tracks in bridge seat of E. abutment of bridge.

B. & O. 311.—*Sharpsburg, Allegheny Co., Pa.*, copper bolt set between tracks in bridge seat of E. abutment of bridge 316.

B. & O. 311A.— $\frac{1}{2}$  mile NW. of *Sharpsburg, Allegheny Co., Pa.*, on bridge 318. (Note 31, p. 128.)

B. & O. 312.—1 mile NW. of *Sharpsburg, Allegheny Co., Pa.*, 30 feet N. of N. portal of Etna tunnel. (Note 28, p. 128.)

B. & O. 313.—*Wittmer, Allegheny Co., Pa.*, 400 feet N. of milepost 7. (Note 21, p. 127.)

B. & O. 314.—*Glenshaw, Allegheny Co., Pa.*, on bridge 319. (Note 31, p. 128.)

B. & O. 314A.—*Mount Royal, Allegheny Co., Pa.*, copper bolt set in W. end of bridge seat of N. abutment of bridge.

B. & O. 315.—400 feet N. of *Elfinwild, Allegheny Co., Pa.* (Note 30, p. 128.)

B. & O. 316.—*Allison Park, Allegheny Co., Pa.*, copper bolt set in W. end of bridge seat of N. abutment of the highway bridge opposite station.

B. & O. 316A.— $\frac{1}{2}$  mile N. of *Allison Park, Allegheny Co., Pa.*, on bridge 323. (Note 31, p. 128.)

B. & O. 317.— $1\frac{1}{2}$  miles N. W. of *Allison Park, Allegheny Co., Pa.*; on bridge at telegraph pole 11/30. copper bolt set in left end of bridge seat of abutment farther from Allison Park.

B. & O. 318.— $\frac{1}{4}$  mile N. of *Bryant, Allegheny Co., Pa.*, copper bolt set between tracks in bridge seat of N. abutment of bridge at telegraph pole 12/36.

B. & O. 318A.— $\frac{3}{4}$  mile N. of *Bryant, Allegheny Co., Pa.*, on bridge 327. (Note 31, p. 128.)

B. & O. 319.—*Wildwood, Allegheny Co., Pa.* (Note 30, p. 128.)

B. & O. 319A.— $\frac{1}{4}$  mile N. of *Wildwood, Allegheny Co., Pa.* (Note 30, p. 128.)

B. & O. 320.—About 1 mile N. of *Wildwood, Allegheny Co., Pa.*, at telegraph pole 14/33. (Note 31, p. 128.)

B. & O. 321.—2 miles N. of *Wildwood, Allegheny Co., Pa.*, 100 feet N. of milepost 16. (Note 33, p. 128.)

B. & O. 322.—About  $\frac{1}{4}$  mile N. of *Gibsonia, Allegheny Co., Pa.*, opposite telegraph pole 17/00 (Note 21, p. 127.)

U. S. G. S.—Just E. of *Gibsonia, Allegheny Co., Pa.*, tablet set in N. end of E. abutment of small bridge. (Note 17, p. 127.)

B. & O. 323.— $\frac{1}{4}$  mile S. of *Bakerstown station, Allegheny Co., Pa.*, at telegraph pole 18/00. (Note 21, p. 127.)

B. & O. 324.—1 mile NW. of *Bakerstown station, Allegheny Co., Pa.*, at telegraph pole 18/35, 800 feet NW. of NW. portal of Bakerstown tunnel. (Note 21, p. 127.)

B. & O. 325.— $\frac{1}{4}$  mile NW. of *Valencia, Butler Co., Pa.*, at telegraph pole 20/00. (Note 21, p. 127.)

B. & O. 326.— $\frac{1}{4}$  mile S. of *Downieville, Butler Co., Pa.*, opposite telegraph pole 21/00. (Note 21, p. 127.)

B. & O. 326A.— $\frac{1}{4}$  mile N. of *Downieville, Butler Co., Pa.*, on small bridge near telegraph pole 21/16. (Note 32, p. 128.)

B. & O. 327.—800 feet SE. of *Mars, Butler Co., Pa.*, at telegraph pole 22/6. (Note 33, p. 128.)

B. & O. 328.— $\frac{3}{4}$  mile NW. of *Mars, Butler Co., Pa.*, copper bolt set in NW. wing wall of box culvert at telegraph pole 23/5, at county road crossing.

B. & O. 329.— $1\frac{3}{4}$  miles W. of *Mars, Butler Co., Pa.*, opposite telegraph pole 24/00. (Note 21, p. 127.)

B. & O. 330.— $\frac{1}{2}$  mile SE. of *Callery Junction, Butler Co., Pa.*, opposite telegraph pole 25/00. (Note 21, p. 127.)

B. & O. 330A.—700 feet SE. of *Callery Junction, Butler Co., Pa.* (Note 31, p. 128.)

B. & O. 331.— $\frac{1}{2}$  mile NW. of *Callery Junction, Butler Co., Pa.*, copper bolt set in SW. end of bridge seat SE. abutment of bridge 45.

B. & O. 332.—About 1 mile SE. of *Evans City, Butler Co., Pa.*, copper bolt set between tracks in mud wall of SE. abutment of bridge 346.

B. & O. 333.—*Evans City, Butler Co., Pa.*, copper bolt set in E. end of abutment of county road bridge.

B. & O. 334.— $\frac{1}{2}$  mile NW. of *Evans City, Butler Co., Pa.*, at milepost 29. (Note 21, p. 127.)

B. & O. 335.— $1\frac{1}{2}$  miles NW. of *Evans City, Butler Co., Pa.*, opposite milepost 30. (Note 21, p. 127.)

B. & O. 335A.—2 miles NW. of *Evans City, Butler Co., Pa.*, copper bolt set between tracks in bridge seat of NW. abutment of bridge at telegraph pole 30/9.

- B. & O. 336.— $\frac{1}{8}$  mile SE. of *Harmony Junction*, *Butler Co., Pa.*, opposite milepost 31. (Note 21, p. 127.)
- B. & O. 337.— $\frac{3}{4}$  mile E. of *Harmony*, *Butler Co., Pa.*, opposite milepost 32. (Note 21, p. 127.)
- B. & O. 338.—W. of *Harmony*, *Butler Co., Pa.*, copper bolt set in first course of masonry at W. end of N. retaining wall.
- B. & O. 339.— $\frac{1}{4}$  mile E. of *Zelienople*, *Butler Co., Pa.*, at milepost 34. (Note 21, p. 127.)
- B. & O. 340.— $\frac{3}{4}$  mile SW. of *Zelienople*, *Butler Co., Pa.*, on small bridge at telegraph pole 34/28. (Note 32, p. 128.)
- B. & O. 341.—100 feet W. of *Old Furnace*, *Beaver Co., Pa.*, at milepost 36. (Note 21, p. 127.)
- B. & O. 341A.— $\frac{1}{2}$  mile NW. of *Old Furnace*, *Beaver Co., Pa.*, on undergrade crossing bridge. (Note 32, p. 128.)
- B. & O. 342.—1 mile E. of *Fombell*, *Beaver Co., Pa.*, copper bolt set in N. end of stone culvert at telegraph pole 36/33.
- B. & O. 343.—*Fombell*, *Beaver Co., Pa.*, on bridge 358. (Note 32, p. 128.)
- B. & O. 344.—*Goehring*, *Beaver Co., Pa.*, at milepost 39. (Note 21, p. 127.)
- B. & O. 345.—*Celia*, *Beaver Co., Pa.*, on bridge 360, telegraph pole 39/34. (Note 31, p. 128.)
- B. & O. 346.— $\frac{1}{4}$  mile W. of *Hazen*, *Beaver Co., Pa.*, at milepost 41. (Note 21, p. 127.)
- B. & O. 347.— $\frac{1}{2}$  mile SE. of *McKimms*, *Beaver Co., Pa.*, at milepost 42. (Note 21, p. 127.)
- B. & O. 348.— $\frac{1}{2}$  mile NW. of *McKimms*, *Beaver Co., Pa.*, at milepost 43. (Note 21, p. 127.)
- B. & O. 348A.—*North Sewickley*, *Beaver Co., Pa.*, on bridge 362. (Note 30, p. 128.)
- B. & O. 349.—About  $\frac{3}{4}$  mile SE. of *Ellwood City*, *Lawrence Co., Pa.*, copper bolt set between tracks in bridge seat of N. abutment of bridge at S. portal of *Ellwood tunnel*.
- B. & O. 349A.— $\frac{1}{2}$  mile E. of *Ellwood City*, *Lawrence Co., Pa.*, under overhead highway bridge. (Note 21, p. 127.)
- B. & O. 350.— $\frac{1}{2}$  mile W. of *Ellwood City*, *Lawrence Co., Pa.*, copper bolt set in S. end of mud wall of W. abutment of high bridge.
- B. & O. 351.— $\frac{1}{8}$  mile N. of *Rock Point*, *Lawrence Co., Pa.*, copper bolt set in rock NE. of track SE. of cut.
- B. & O. 352.—1 mile N. of *Rock Point*, *Lawrence Co., Pa.*, copper bolt set between tracks, mud wall of N. abutment of bridge 365.
- B. & O. 353.—100 feet SE. of station at *Chewton*, *Lawrence Co., Pa.*, copper bolt set in NW. end of NE. coping of culvert.
- B. & O. 354.— $1\frac{1}{2}$  miles NW. of *Chewton*, *Lawrence Co., Pa.*, at the old limekiln. (Note 21, p. 127.)
- B. & O. 355.—About 2 miles NW. of *Chewton*, *Lawrence Co., Pa.*, undergrade crossing bridge 366. (Note 33, p. 128.)
- B. & O. 356.—*West Pittsburg*, *Lawrence Co., Pa.*, copper bolt in S. end of bridge seat, E. abutment of highway bridge over the *Pittsburg and Lake Erie R. R.*
- B. & O. 357.— $\frac{3}{4}$  mile N. of *West Pittsburg*, *Lawrence Co., Pa.*, on undergrade highway crossing bridge 369. (Note 31, p. 128.)
- B. & O. 359.—About  $\frac{1}{4}$  mile NW. of *New Castle Junction*, *Lawrence Co., Pa.*, on *Pittsburg and Lake Erie R. R.* bridge over *Shenango River*. (Note 32, p. 128.)
- B. & O. 359A.— $\frac{1}{2}$  mile NW. of *New Castle Junction*, *Lawrence Co., Pa.*, copper bolt set in concrete foundation of *Pittsburg and Lake Erie R. R.* signal bridge, in more easterly of two northern pedestals for first bridge E. of *Mahoningtown*.
- U. S. G. S.—*Mahoningtown*, *Lawrence Co., Pa.*, chiseled square in wing wall S. abutment of highway bridge over *Mahoning River* near the *P. Y. & A. R. R.* tracks.
- B. & O. 360.—About  $\frac{1}{2}$  mile NW. of *Mahoningtown*, *Lawrence Co., Pa.*, on first bridge signal W. of *Mahoningtown*. (Note 37, p. 128.)
- B. & O. 361.— $1\frac{1}{4}$  miles NW. of *Mahoningtown*, *Lawrence Co., Pa.*, on second signal NW. of *Mahoningtown*. (Note 37, p. 128.)
- B. & O. 362.—About 2 miles NW. of *Mahoningtown*, *Lawrence Co., Pa.*, NW. of *Pittsburg and Lake Erie R. R.* through line station 2720, third signal NW. of *Mahoningtown*. (Note 37, p. 128.)
- B. & O. 363.— $2\frac{3}{4}$  miles NW. of *Mahoningtown*, *Lawrence Co., Pa.*, W. of *Pittsburg and Lake Erie R. R.* through line station 2760, fourth signal W. of *Mahoningtown*. (Note 37, p. 128.)
- B. & O. 364.— $3\frac{1}{2}$  miles NW. of *Mahoningtown*, *Lawrence Co., Pa.*, NW. of through line station 2800, fifth signal NW. of *Mahoningtown*. (Note 37, p. 128.)

B. & O. 365.— $\frac{1}{2}$  mile E. of *Edenburg, Lawrence Co., Pa.*, W. of through line station 2840. (Note 37, p. 128.)

B. & O. 366.— $\frac{1}{2}$  mile W. of *Edenburg, Lawrence Co., Pa.*, at through line station 2880. (Note 37, p. 128.)

B. & O. 367.— $1\frac{1}{4}$  miles W. of *Edenburg, Lawrence Co., Pa.*, near through line station 2920. (Note 37, p. 128.)

B. & O. 368.—About 2 miles W. of *Edenburg, Lawrence Co., Pa.*, near through line station 2960. (Note 37, p. 128.)

B. & O. 369.—About 3 miles W. of *Edenburg, Lawrence Co., Pa.*, near through line station 3000. (Note 37, p. 128.)

B. & O. 370.—About  $3\frac{1}{2}$  miles W. of *Edenburg, Lawrence Co., Pa.*, about 2 miles E. of *Lowellville, Mahoning Co., Ohio*, near through line station 3040. (Note 37, p. 128.)

B. & O. 371.—About  $4\frac{1}{4}$  miles W. of *Edenburg, Lawrence Co., Pa.*, and about 1 mile E. of *Lowellville, Mahoning Co., Ohio*, near through line station 3080. (Note 37, p. 128.)

B. & O. 372.—500 feet E. of station at *Lowellville, Mahoning Co., Ohio*, at telegraph pole 67/30. (Note 21, p. 127.)

B. & O. 373.—1 mile NW. of *Lowellville, Mahoning Co., Ohio*, 600 feet SE. of *Pittsburg and Lake Erie R. R.* water tanks, 100 feet SE. of *Baltimore and Ohio* culvert. (Note 21, p. 127.)

B. & O. 374.—1 mile SE. of *Struthers, Mahoning Co., Ohio*, at telegraph pole 69/35. (Note 21, p. 127.)

B. & O. 375.— $\frac{1}{2}$  mile SE. of *Struthers, Mahoning Co., Ohio*, copper bolt set in S. end of E. abutment of bridge 20.

B. & O. 376.—*Struthers, Mahoning Co., Ohio.* (See p. 229.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN ELLWOOD CITY AND MONACA, PA., 1906.

B. & O. 349.—About  $\frac{3}{4}$  mile E. of *Ellwood City, Lawrence Co., Pa.* (See p. 226.)

B. & O. 349A.—*Ellwood City, Lawrence Co., Pa.* (See p. 226.)

B. & O. 350.—*Near Ellwood City, Lawrence Co., Pa.* (See p. 226.)

A<sub>2</sub>.—About  $\frac{1}{2}$  mile N. of *West Ellwood Junction, Beaver Co., Pa.*, on the spur line of the *Pittsburg and Lake Erie R. R.* running to *Ellwood City*; on the W. abutment to the bridge over the *Beaver River*; in the S. end of the back wall. (Note 13, p. 127.)

Br. 40.—*Summit, Beaver Co., Pa.*, on the *Pennsylvania R. R.* right of way; the extreme NE. corner of the back wall to the E. abutment of bridge 40; the bridge number is anchored to the stone.

Br. 39 (1906).—About  $\frac{1}{4}$  mile W. of *Homewood, Beaver Co., Pa.*, on the *Pennsylvania R. R.* right of way; the top of the NE. corner of the E. concrete bridge seat of bridge 39. Not marked.

Br. 38 (1906).—*Homewood, Beaver Co., Pa.*, on the *Pennsylvania R. R.* right of way; the NE. corner of the E. stone of the N. coping of bridge 38. Not marked.

Br. 34.—*Mayfield, Beaver Co., Pa.*, on the *Pennsylvania R. R.* right of way; on the N. end of the E. bridge seat for bridge 34; an outlined square.

Geneva Depot (1906).—*Geneva, Beaver Co., Pa.*, on the N. side of the *Pennsylvania R. R.* tracks; on the SE. corner of the most eastern doorsill of the depot. (Note 13, p. 127.)

Beaver Falls Depot (1906).—*Beaver Falls, Beaver Co., Pa.*, at the *Pennsylvania R. R.* depot; on the NE. corner of the doorsill of the main entrance to the waiting room. (Note 13, p. 127.)

Br. 29.—*Kenwood, Beaver Co., Pa.*, about 1 mile E. of the *Beaver Falls depot*, on the NE. corner of the E. back wall to bridge 29; an outlined square marked "B M."

New Brighton Depot.—*New Brighton, Beaver Co., Pa.*, on the SE. corner of the water table of the *Pennsylvania R. R.* depot; a seat cut in the beveled surface.

Br. 27 $\frac{1}{2}$ .—About  $\frac{3}{4}$  mile E. of *New Brighton, Beaver Co., Pa.*, on the *Pennsylvania R. R.* right of way; at the N. end of the E. back wall of bridge 27 $\frac{1}{2}$ , over a public highway; an outlined square marked "B M."

Br. 26.—About 1.8 miles E. of the depot at *New Brighton, Beaver Co., Pa.*, on the NW. corner of the E. bridge seat for bridge 26; an outlined square marked "B M."

25A.—*Monaca, Beaver Co., Pa.*, on the top step of the SW. wing wall of the *Pittsburg and Lake Erie R. R.* bridge over the *Ohio River*; a seat cut in the S. face of the stone, about 3 inches below the top surface, and marked "U. S. B. M." (The bridge is assumed to be N. and S.)

25C.—*Monaca, Beaver Co., Pa.* (See App. 3, Report for 1903, p. 763.) Not found, 1906.

## DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN ALLIANCE AND STRUTHERS, OHIO, 1906.

Br. 66.—About  $1\frac{1}{2}$  miles E. of *Alliance, Stark Co., Ohio*, on the Pennsylvania R. R. right of way; on the E. abutment of bridge 66; a square cut on the NW. corner.

Q<sub>6</sub>.—*Alliance, Stark Co., Ohio*, on West Main street, at the SE. corner of the Knights of Pythias Hall; in the S. face of the base stone and  $\frac{1}{2}$  meter above the cement walk. (Note 1, p. 126.)

City.—*Alliance, Stark Co., Ohio*, on the NE. corner of Freedom and Main streets, at the SW. corner of the Lewis Block; an iron bolt, anchored to the foundation and extending slightly above the level of the cement walk, about 5 centimeters from the N. wall.

R<sub>6</sub>.—*Alliance, Stark Co., Ohio*, at the SE. corner of Freedom and Court streets; in the front face of the city hall, about  $\frac{1}{2}$  meter from the S. side, on the horizontal surface of the water table. (Note 15, p. 127.)

Lunch room.—*Alliance, Stark Co., Ohio*, on the N. side of the Pennsylvania R. R. depot; on the NW. corner of the iron sill to the lunch-room door. (Note 13, p. 127.)

Br. 65 (1906).—1.5 miles E. of *Alliance, Stark Co., Ohio*, on the Pennsylvania R. R. right of way; on the NW. corner of the E. abutment to bridge 65. (Note 15, p. 127.)

Br. 64 (1906).—1.7 miles E. of *Alliance, Stark Co., Ohio*, on the Pennsylvania R. R. right of way; on the NE. corner of the E. back wall of bridge 64. (Note 13, p. 127.)

West Culvert.—About  $\frac{1}{2}$  mile W. of *Sebring, Mahoning Co., Ohio*, on Pennsylvania R. R. right of way; on the NW. corner of the E. abutment of an open culvert; a large square in outline, marked "B. M."

East Culvert.—About 0.5 mile W. of *Sebring, Mahoning Co., Ohio*, on the Pennsylvania R. R. right of way; in the NW. corner of the E. abutment of a box culvert; marked "B. M." (Note 13, p. 127.)

S<sub>6</sub>.—1 mile S. of *Snodes, Mahoning Co., Ohio*, on the Pennsylvania R. R. right of way, at milepost 22; in the middle of the E. coping of the concrete culvert. (Note 15, p. 127.)

T<sub>6</sub>.—About  $2\frac{1}{2}$  miles S. of *Berlin Center, Mahoning Co., Ohio*, on the Pennsylvania R. R. right of way, five telegraph poles N. of milepost 20; in the middle of the W. end of the N. concrete abutment to bridge 26. Character of mark not given by observer.

U<sub>6</sub>.—About 2 miles S. of *Berlin Center, Mahoning Co., Ohio*, 17 telegraph poles S. of milepost 24; at the SW. corner of the Western Reserve Line crossing, 15 meters W. of the track. (Note 2, p. 126.)

V<sub>6</sub>.—70 meters N. of the Pennsylvania R. R. depot, at *Berlin Center, Mahoning Co., Ohio*, and 15 meters E. of the tracks; on the base of the SW. support of the R. R. water tank. (Note 16, p. 127.)

W<sub>6</sub>.—*Ellsworth, Mahoning Co., Ohio*, about 90 meters S. of the Pennsylvania R. R. depot; in the NW. corner of the large stone step of the public-school building. (Note 5, p. 127.)

X<sub>6</sub>.—*Rosemont, Mahoning Co., Ohio*, at the SE. corner of the Pennsylvania R. R. depot; on the curbing of the platform, 5 centimeters from the building. (Note 13, p. 127.)

Y<sub>6</sub>.—*Rosemont, Mahoning Co., Ohio*, 100 meters W. of the Pennsylvania R. R. depot, on the public highway; in the middle of the N. coping of the stone culvert. (Note 5, p. 127.)

Z<sub>6</sub>.—*Rosemont, Mahoning Co., Ohio*, about 0.3 mile W. of the depot, at the public-road crossing; in the NW. corner of the public-school grounds. (Note 2, p. 126.)

A<sub>7</sub>.—*North Jackson, Mahoning Co., Ohio*, about  $\frac{1}{4}$  mile E. of the Pennsylvania R. R. depot; in the SW. corner of the E. abutment of the highway bridge. (Note 1, p. 126.)

B<sub>7</sub>.—At *North Jackson, Mahoning Co., Ohio*, 45 meters SE. of the depot; at a corner of the fence, 40 meters E. of the R. R. crossing. (Note 2, p. 126.)

C<sub>7</sub>.—1.4 miles N. of *North Jackson, Mahoning Co., Ohio*, on the Pennsylvania R. R. right of way, one telegraph pole from milepost 7; in the middle of the E. coping of the concrete arch bridge 10. (Note 14, p. 127.)

D<sub>7</sub>.—*Lordstown, Trumbull Co., Ohio*, at the NW. corner of the road crossing, four telegraph poles N. of milepost 5; in the corner of the fence, and on the land belonging to Ada Horn. (Note 2, p. 126.)

E<sub>7</sub>.—About 0.8 mile N. of *Lordstown, Trumbull Co., Ohio*, on the Pennsylvania R. R. right of way, at milepost 4; on the W. end of the N. abutment to bridge 6. (Note 13, p. 127.)

F<sub>7</sub>.—Near *Boenna Crossing*, 2 miles SW. of *Niles, Trumbull Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 100 meters E. of the Pennsylvania R. R.; on the lower step of the undergrade crossing bridge 423. (Note 1, p. 126.)

G<sub>7</sub>.—About  $1\frac{1}{2}$  miles SE. of *Niles, Trumbull Co., Ohio*, and 2.8 miles E. of *Boenna Crossing*, at the SE. corner of the road crossing, 15 meters from the Baltimore and Ohio R. R. tracks; in the corner of the fence, on land owned by John Dove. (Note 2, p. 126.)

H<sub>7</sub>.—About 0.5 mile W. of *Girard, Trumbull Co., Ohio*, on the Baltimore and Ohio R. R. right of way; on the culvert at telegraph pole 81/28½; in the middle of the S. coping. (Note 13, p. 127, marked U. S. B. M.)

I<sub>7</sub>.—About 3½ miles NW. of the new Baltimore and Ohio station at *Youngstown, Mahoning Co., Ohio*, at telegraph pole 79/28½; at the W. end of the large cut, on the side of the hill; 25 meters S. of the Baltimore and Ohio R. R. tracks, at an offset in the right-of-way fence; set in clay. (Note 2, p. 126.)

J<sub>7</sub>.—1 mile W. of the new Baltimore and Ohio depot at *Youngstown, Mahoning Co., Ohio*, on the Baltimore and Ohio R. R. right of way; on the N. end of the top step of the E. abutment to bridge 410. (Note 5, p. 127.)

B. & O. 381.—1 mile W. of *Youngstown, Mahoning Co., Ohio*, at telegraph pole 76/23, on the old line E. of the river; directly beneath the semaphore bridge. (Note 21, p. 127.)

B. & O. 380.—*Youngstown, Mahoning Co., Ohio*, 200 feet E. of the old Baltimore and Ohio R. R. passenger station, on the old line E. of the river; a copper bolt in the second course of masonry at the W. end of the retaining wall.

B. & O. 379.—Near *Youngstown, Mahoning Co., Ohio*; probably lost.

Railroad.—*Youngstown, Mahoning Co., Ohio*, near the Lake Shore R. R. depot; on the foundation of the W. beam supporting the overhead highway bridge; between the Baltimore and Ohio, and Pittsburgh and Lake Erie tracks; a seat cut on the NW. corner.

B. & O. 378 (1906).—*Hazellon, Mahoning Co., Ohio*, at Andrew Bros. Crossing. At the time of this survey the top course of stone of bridge 24, S. coping, had been removed; this course was found and measured (0.470 meter); the point where the stone containing B. M. had rested, the W. end of the S. coping, is the present B. M.

837 ADJ.—*Hazellon, Mahoning Co., Ohio*, on the Baltimore and Ohio R. R. right of way, at Andrews Bros. crossing; on the top course of the N. wing wall of the E. abutment to bridge 24. (Note 17, p. 127.)

B. & O. 377.—1 mile W. of *Struthers, Mahoning Co., Ohio*, on Baltimore and Ohio R. R. right of way, and S. of tracks; on the W. abutment of bridge 22; a copper bolt in the concrete flume.

B. & O. 376.—*Struthers, Mahoning Co., Ohio*, at the N. end of the highway bridge over the Pittsburgh and Lake Erie R. R. tracks; a copper bolt in the SW. corner of the bridge seat.

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN EAST AKRON JUNCTION AND SULLIVAN, OHIO, 1903.

[These descriptions were furnished by the Chief Engineer of the Baltimore and Ohio Railroad. Where necessary, the names of town, county, and State have been added for the purpose of indexing, and in many cases certain information has been condensed into the form of notes. In accordance with railroad usage, the directions in the descriptions as furnished were given according to the general direction of the railroad line. These have been changed to true directions as far as could be determined. In other respects the wording of the original descriptions has not been changed.]

Wall.—*East Akron Junction, Summit Co., Ohio*, United States Geological Survey B. M. (See App. 8, Report 1903, p. 762.)

B. & O. 441.—600 feet E. of Union Station, *Akron, Summit Co., Ohio*, copper bolt set in E. end of retaining wall on N. side of tracks.

B. & O. 442.—1 mile SW. of Union Station, *Akron, Summit Co., Ohio*, copper bolt set in SW. end of NW. coping of culvert along Cleveland, Akron and Columbus R. R. tracks.

B. & O. 443.—3½ miles SW. of *Akron, Summit Co., Ohio*, on Cleveland, Akron and Columbus bridge over old canal. (Note 33, p. 128.)

B. & O. 444.—P. R. R.—*Barberton, Summit Co., Ohio*, SE. corner of stone doorsill at entrance to ladies' waiting room.

B. & O. 445.—¾ mile S. of *Barberton, Summit Co., Ohio*, on bridge 18, Cleveland, Akron and Columbus R. R. (Note 33, p. 128.)

B. & O. 446.—2½ miles W. of *Barberton, Summit Co., Ohio*, copper bolt set in E. end of small culvert, ⅝ mile S. of milepost H. 22.

B. & O. 447.—Near *Turkeyfoot Junction, Summit Co., Ohio*, copper bolt set in W. end of small Cleveland, Akron and Columbus culvert, 300 feet S. of milepost H. 24.

P. R. R.—*Messenger, Summit Co., Ohio*, about 2 miles E. of Warwick, NE. corner of S. pier of water tank.

B. & O. 448.—¼ mile NE. of *Clinton, Summit Co., Ohio*, copper bolt set in NW. end of small Cleveland, Akron and Columbus culvert, ¼ mile SW. of Clinton coaling station.

B. & O. 449.— $\frac{1}{4}$  mile NE. of *Warwick, Summit Co., Ohio*, copper bolt set in SE. corner of small Cleveland, Akron and Columbus culvert.

B. & O. 450.—In Wayne Co.,  $\frac{3}{4}$  mile NW. of *Warwick, Summit Co., Ohio*, copper bolt set in NE. corner of old part of culvert.

B. & O. 451.—In Wayne Co., about  $1\frac{1}{2}$  miles NW. of *Warwick, Summit Co., Ohio*, copper bolt set in W. end of N. coping of culvert, 500 feet W. of milepost 59, on eastbound track.

B. & O. 452.—In Wayne Co.,  $2\frac{3}{4}$  miles SE. of *Easton, Wayne Co., Ohio*, copper bolt set in W. end of N. coping of culvert, 100 feet E. of milepost 58, on eastbound track.

B. & O. 453.— $1\frac{3}{4}$  miles SE. of *Easton, Wayne Co., Ohio*, opposite milepost 57. (Note 29, p. 128.)

B. & O. 454.—0.7 mile SE. of *Easton, Wayne Co., Ohio*, opposite milepost 56. (Note 29, p. 128.)

B. & O. 455.—300 feet NW. of station at *Easton, Wayne Co., Ohio*, copper bolt set in N. wing wall of SE. abutment of bridge, on westbound track.

B. & O. 456.— $1\frac{1}{4}$  miles NW. of *Easton, Wayne Co., Ohio*, at milepost 54. (Note 29, p. 128.)

B. & O. 457.— $\frac{1}{2}$  mile E. of *Rittman, Wayne Co., Ohio*, at milepost 53. (Note 29, p. 128.)

B. & O. 458.— $\frac{1}{2}$  mile SW. of *Rittman, Wayne Co., Ohio*, at milepost 52. (Note 29, p. 128.)

B. & O. 459.— $1\frac{1}{2}$  miles W. of *Rittman, Wayne Co., Ohio*, on bridge 94, 500 feet W. of milepost 51. (Note 33, p. 128.)

B. & O. 460.— $2\frac{1}{2}$  miles W. of *Rittman, Wayne Co., Ohio*, at milepost 50. (Note 29, p. 128.)

B. & O. 460A.—1 mile E. of *Sterling, Wayne Co., Ohio*, United States Geological Survey B. M.; in the bridge seat at S. end of E. abutment of Erie R. R. bridge. (Note 17, p. 127.) Probably moved since being set on account of double tracking.

B. & O. 461.— $\frac{1}{4}$  mile E. of *Sterling, Wayne Co., Ohio*, vertical rail section set on N. side of tracks opposite milepost 49.

B. & O. 462.— $\frac{3}{4}$  mile NW. of *Sterling, Wayne Co., Ohio*, at milepost 48. (Note 29, p. 128.)

B. & O. 463.— $\frac{3}{4}$  mile SE. of *Sterling, Wayne Co., Ohio*, at milepost 47. (Note 29, p. 128.)

B. & O. 464.— $\frac{1}{4}$  mile NW. of *Creston, Wayne Co., Ohio*, at milepost 46. (Note 29, p. 128.)

B. & O. 465.—In Medina Co.  $1\frac{1}{4}$  miles NW. of *Creston, Wayne Co., Ohio*, at milepost 45. (Note 29, p. 128.)

B. & O. 466.—In Medina Co.,  $2\frac{1}{4}$  miles NW. of *Creston, Wayne Co., Ohio*, at milepost 44. (Note 29, p. 128.)

B. & O. 467.—In Medina Co.,  $3\frac{1}{4}$  miles NW. of *Creston, Wayne Co., Ohio*, at milepost 43. (Note 29, p. 128.)

B. & O. 468.—3 miles SE. of *Lodi, Medina Co., Ohio*, at milepost 42. (Note 29, p. 128.)

B. & O. 469.— $2\frac{1}{2}$  miles SE. of *Lodi, Medina Co., Ohio*, copper bolt set in N. end of small culvert at telegraph pole 34/17.

B. & O. 470.—1 mile SE. of *Lodi, Medina Co., Ohio*, at milepost 40. (Note 29, p. 128.)

B. & O. 471.—800 feet E. of *Lodi, Medina Co., Ohio*, in unstable ground. (Note 29, p. 128.)

B. & O. 472.—1 mile SW. of *Lodi, Medina Co., Ohio*, at milepost 38. (Note 29, p. 128.)

B. & O. 473.—2 miles SW. of *Lodi, Medina Co., Ohio*, copper bolt set in NW. end of small culvert at telegraph pole 38/25 $\frac{1}{2}$ .

B. & O. 474.—3 miles SW. of *Lodi, Medina Co., Ohio*, on bridge 118, telegraph pole 39/24 $\frac{1}{2}$ . (Note 32, p. 128.)

B. & O. 475.—4 miles W. of *Lodi, Medina Co., Ohio*, on bridge 120, telegraph pole 40/27. (Note 32, p. 128.)

B. & O. 476.— $1\frac{3}{4}$  miles E. of *Homer, Medina Co., Ohio*, copper bolt set in S. end of small culvert at telegraph pole 41/18.

B. & O. 477.— $\frac{1}{4}$  mile E. of *Homer, Medina Co., Ohio*, at milepost 33. (Note 29, p. 128.)

B. & O. 478.—500 feet W. of *Newtons, Medina Co., Ohio*, at telegraph pole 44/10. (Note 29, p. 128.)

B. & O. 479.—1 mile W. of *Newtons, Medina Co., Ohio*, copper bolt set in S. end of small culvert at telegraph pole 45/10.

B. & O. 480.— $1\frac{3}{4}$  miles W. of *Newtons, Medina Co., Ohio*, copper bolt set in N. end of small culvert at milepost 30.

B. & O. 481.—Near *Sullivan, Ashland Co., Ohio*. (See p. 231.)

## DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN GREENWICH AND SULLIVAN, OHIO.

B. & O. 495.—About  $\frac{3}{4}$  mile E. of *Greenwich, Huron Co., Ohio*, on the arch culvert at telegraph pole 62/23 $\frac{1}{2}$ ; a copper bolt in the E. end of N. coping.

B. & O. 494.—About 1.8 miles E. of *Greenwich, Huron Co., Ohio*, on the arch culvert at telegraph pole 62/21 $\frac{1}{2}$ ; a copper bolt in the W. end of the N. coping.

B. & O. 493.—About 2.8 miles E. of *Greenwich, Huron Co., Ohio*, on the arch culvert at telegraph pole 61/21 $\frac{1}{2}$ ; a copper bolt in the E. end of the N. coping.

B. & O. 492.—In *Huron Co., Ohio*, about  $\frac{1}{4}$  mile W. of *Ramey, Ashland Co., Ohio*, on the large arch bridge at telegraph pole 60/18; a copper bolt in the E. end of the N. coping.

B. & O. 491.—About 1.5 miles W. of *Hereford, Ashland Co., Ohio*, on a large arch bridge; a copper bolt in the E. end of the N. coping.

B. & O. 490.—Near *Hereford, Ashland Co., Ohio*, on a steel-girder bridge, about 800 feet W. of the R. R. station. (Note 32, p. 128).

B. & O. 489.—About 0.9 mile E. of *Hereford, Ashland Co., Ohio*, on the bridge at telegraph pole 57/5; a copper bolt in the S. end of the E. abutment.

B. & O. 488.—About 1.9 miles E. of *Hereford, Ashland Co., Ohio*, on a small culvert at telegraph pole 56/6; a copper bolt in the W. end of the S. coping.

B. & O. 487.—About 2 miles NW. of *Nova, Ashland Co., Ohio*, on the large arch bridge at telegraph pole 55/1 $\frac{1}{2}$ ; a copper bolt in the E. end of the N. coping.

B. & O. 486.—About 0.6 mile W. of *Nova, Ashland Co., Ohio*, on the culvert at telegraph pole 53/17 $\frac{1}{2}$ ; a copper bolt in the W. end of the N. coping.

1127 ADJ.—*Nova, Ashland Co., Ohio*; T. 1 N., R. 19 W., in the foundation wall of the United Brethren Church, on the S. face of the SE. corner; marked "1127 ADJ 1903." (Note 17, p. 127.)

B. & O. 485A.—*Nova, Ashland Co., Ohio*, about 325 feet E. of the station on a small culvert; the NE. corner of the N. coping, at the top of the beveled surface.

B. & O. 485.—About 0.5 mile E. of *Nova, Ashland Co., Ohio*, on the small culvert at telegraph pole 52/15; a copper bolt in the N. end.

B. & O. 484.—About 1.5 miles E. of *Nova, Ashland Co., Ohio*, on the culvert at telegraph pole 51/14; a copper bolt in the W. end of the S. coping.

B. & O. 483.—About 1.5 miles W. of *Sullivan, Ashland Co., Ohio*, at milepost 26. (Note 29, p. 128.)

B. & O. 482.—*Sullivan, Ashland Co., Ohio*, about 300 feet E. of the station, on the culvert at telegraph pole 48/14; a copper bolt in the W. end of the N. coping.

1136 Canton.—*Sullivan, Ashland Co., Ohio*, at the SW. corner of the schoolhouse, in the vertical surface of the water table, marked "1136 Canton ADJ 1903." (Note 17, p. 127.)

B. & O. 481.—About 1.5 miles E. of *Sullivan, Ashland Co., Ohio*, at milepost 29. (Note 29, p. 128.)

## DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN GREENWICH AND CHICAGO JUNCTION, OHIO, 1903.

[These descriptions were furnished by the Chief Engineer of the Baltimore and Ohio Railroad. Where necessary, the names of town, county, and State have been added for the purpose of indexing, and in many cases certain information has been condensed into the form of notes. In accordance with railroad usage the directions in the descriptions as furnished were given according to the general direction of the railroad line. These have been changed to true directions as far as could be determined. In other respects the wording of the original descriptions has not been changed.]

B. & O. 495.—Near *Greenwich, Ohio*. (See above.)

B. & O. 496.— $\frac{1}{4}$  mile W. of *Greenwich, Huron Co., Ohio*, copper bolt set in S. end of E. abutment of bridge for undergrade street crossing.

B. & O. 497.—1 mile W. of *Greenwich, Huron Co., Ohio*, copper bolt set in E. end of N. coping of large arch at telegraph pole 65/17 $\frac{1}{2}$ .

B. & O. 498.—1 $\frac{1}{3}$  miles W. of *Greenwich, Huron Co., Ohio*, vertical rail section set 20 feet N. of tracks, by telegraph pole 65/5.

B. & O. 499.—2 $\frac{1}{4}$  miles W. of *Greenwich, Huron Co., Ohio*, copper bolt set in E. end of N. coping of small culvert at telegraph pole 67/7 $\frac{1}{2}$ .

B. & O. 500.—1 $\frac{1}{2}$  miles E. of *Boughtonville, Huron Co., Ohio*, copper bolt set in E. pedestal of highway bridge at telegraph pole 69/10, S. of tracks.

B. & O. 501.—300 feet E. of *Boughtonville, Huron Co., Ohio*, copper bolt set in W. end of S. coping of arch bridge.



B. & O. 502.— $\frac{3}{4}$  mile W. of *Boughtonville, Huron Co., Ohio*, copper bolt set in E. end of S. coping of culvert at telegraph pole 70/18.

B. & O. 503.— $1\frac{3}{4}$  miles W. of *Boughtonville, Huron Co., Ohio*. (See below.)

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN CHICAGO JUNCTION AND DESHLER, OHIO, 1906.

B. & O. 503.—About  $1\frac{3}{4}$  miles W. of *Boughtonville, Huron Co., Ohio*, at telegraph pole 71/18; a copper bolt set in the S. end of the E. abutment of an undergrade crossing bridge.

B. & O. 504.—About 3 miles E. of *Chicago Junction, Huron Co., Ohio*, 700 feet E. of milepost 3; originally a copper bolt set in the S. end of the E. abutment of an undergrade crossing bridge. In 1905 it was found that the copper bolt had been removed and the top surface of the stone close to the hole on the S. side was used as the B. M.

B. & O. 505.—2 miles E. of *Chicago Junction, Huron Co., Ohio*, opposite milepost 2. (Note 21, p. 127.)

B. & O. 506.—About 1 mile E. of *Chicago Junction, Huron Co., Ohio*, 500 feet W. of milepost 1; a copper bolt set in the E. end of the S. coping of a culvert.

B. & O. 507.—*Chicago Junction, Huron Co., Ohio*, 600 feet E. of the Lake Branch R. R. crossing. (Note 21, p. 127.)

F<sub>3</sub>.—*Chicago Junction, Huron Co., Ohio*, at the corner of Washington and First streets; a cross cut in the top surface of the E. end of the top step of St. Francis Xavier Church.

G<sub>3</sub>.—*Chicago Junction, Huron Co., Ohio*, at the corner of Myrtle avenue and Pearl street, at the SW. corner of the Sheidley Hotel block, on the side facing Myrtle avenue; in the second course of brick above the water table. (Note 4, p. 127.)

H<sub>3</sub>.—*Chicago Junction, Huron Co., Ohio*, about 200 meters S. of the Baltimore and Ohio R. R. tracks, on the W. side of Myrtle avenue; in the E. end of the sandstone sill of the Home Savings and Banking Co.'s building. (Note 1, p. 126.)

I<sub>3</sub>.—About  $2\frac{1}{2}$  miles W. of *Chicago Junction, Huron Co., Ohio*, on the Baltimore and Ohio R. R. right of way, at the second telegraph pole W. of milepost 269 (C) and on a knoll 12 meters S. of the track. (Note 2, p. 126.)

J<sub>3</sub>.—About 3 miles W. of *Chicago Junction, Huron Co., Ohio*, on the Baltimore and Ohio R. R. right of way,  $3\frac{1}{2}$  telegraph poles E. of milepost 268, and 5 meters N. of the track; in the top surface of the coping of a culvert. (Note 5, p. 127.)

K<sub>3</sub>.—About 5 miles W. of *Chicago Junction, Huron Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 8 telegraph poles E. of milepost 266; in the center of the top surface of the gray sandstone coping of a culvert. (Note 4, p. 127.)

L<sub>3</sub>.—*Siam, Seneca Co., Ohio*; on the Baltimore and Ohio R. R. right of way, 75 meters W. of the Pennsylvania R. R. crossing; about 2 meters S. of the track, in the center of a concrete block, about 3 by 4 feet on the top surface, set level with the grade. (Note 1, p. 126.)

M<sub>3</sub>.—*Siam, Seneca Co., Ohio*; on the Baltimore and Ohio R. R. right of way; 375 meters W. of the Pennsylvania R. R. crossing, about 15 meters N. of the track, in a corner of the fence at a road crossing. (Note 2, p. 126.)

N<sub>3</sub>.—About 3 miles W. of *Siam, Seneca Co., Ohio*; on the Baltimore and Ohio R. R. right of way, in the N. end of the W. abutment of an undergrade crossing bridge. (Note 5, p. 127.)

O<sub>3</sub>.—About 1 mile W. of *Scipio (siding), Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 3 telegraph poles E. of the signboard "1 mile to Scipio;" in the center of the top surface of the N. end of a concrete culvert. (Note 4, p. 127.)

859 Republic.—A B. M. of the United States Geological Survey about  $\frac{1}{4}$  mile E. of *Republic, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. undergrade crossing bridge, over Marion state road; a square cut in outline on the top surface of the southernmost stone in the lower course.

883 Col.—*Republic, Seneca Co., Ohio*, in the SW. corner of the town hall; on the W. side, in the vertical face of the water table. (Note 17, p. 127.)

P<sub>3</sub>.—Near *Republic, Seneca Co., Ohio*; 12 telegraph poles west of milepost 255; on a knoll in the Baltimore and Ohio R. R. right of way, 12 meters S. of the track. (Note 11, p. 127.)

Q<sub>3</sub>.— $\frac{1}{2}$  mile W. of the signboard at *Seneca, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 15 meters S. of the track, at an offset in the right-of-way fence. (Note 2, p. 126.)

R<sub>5</sub>.—About 3 miles E. of *Tiffin, Seneca Co., Ohio*; on the Baltimore and Ohio R. R. right of way, in the center of the S. coping to stone arch bridge 58. (Note 4, p. 127.)

S<sub>5</sub>.—About 1 mile E. of *Tiffin, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way,  $\frac{1}{4}$  mile W. of milepost 248, and 300 meters E. of the junction of the Baltimore and Ohio and Pennsylvania R. Rs.; in the center of the S. girder (concrete) of bridge 61. (Note 1, p. 126.)

757 Col.—*Tiffin, Seneca Co., Ohio*, in the SW. corner of the court-house, W. face, in a window sill. (Note 17, p. 127.)

775 Tiffin.—*Tiffin, Seneca Co., Ohio*, at the corner of Washington and Welmore streets, at the front entrance to the Catholic church; a chiseled square cut in the E. end of the lower step.

T<sub>5</sub>.—*Tiffin, Seneca Co., Ohio*, on the Munroe Street bridge over Sandusky River, in the E. side of the N. abutment, about 2 feet from the guard rail, on the second course of stone. (Note 4, p. 127.)

U<sub>5</sub>.—About 2½ miles W. of *Tiffin, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 400 meters W. of milepost 245; in the N. end of the W. abutment of a bridge over a creek. (Note 1, p. 126.)

V<sub>5</sub>.—About 2 miles E. of *Bascom, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 150 meters W. of milepost 243; in the N. end of the W. abutment of bridge 68 over Wolf Creek. (Note 5, p. 127.)

W<sub>5</sub>.—About 1 mile E. of *Bascom, Seneca Co., Ohio*, 90 meters W. of milepost 242 and 25 meters S. of the Baltimore and Ohio R. R. tracks; on the farm of Joseph Leonard, at the NE. corner of the junction of the roads. (Note 2, p. 126.)

776 Bascom.—*Bascom, Seneca Co., Ohio*, near Crumm's store; at the NW. corner of the cross-roads; a cross cut in the bottom of a round hole in a stone used for the crossing.

766 Tol.—0.2 mile S. of *Bascom, Seneca Co., Ohio*, S. of the cemetery; in the SW. abutment of an iron highway bridge over a creek. (Note 17, p. 127.)

X<sub>5</sub>.—About 2 miles W. of *Bascom, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, at a road crossing, at milepost 239.5 meters N. of the track, on the top step of the E. side of a sandstone culvert. (Note 1, p. 126.)

Y<sub>5</sub>.—About 3 miles E. of *Fostoria, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, in the N. end of the W. abutment of a steel girder bridge over Raccoon Creek. (Note 5, p. 127.)

Z<sub>5</sub>.—About 2 miles E. of *Fostoria, Seneca Co., Ohio*, on the Baltimore and Ohio R. R. right of way, on the N. side of the track; in the center of the capstone of a culvert. (Note 4, p. 127.)

778 Fostoria.—*Fostoria, Seneca Co., Ohio*, at the NW. corner of Jones and Main streets; the top surface of the check valve of the city water plug.

A<sub>6</sub>.—*Fostoria, Seneca Co., Ohio*, at the corner of Main and Center streets, in the SW. corner of the First National Bank building; on the E. side of the Center Street entrance, in the vertical surface of the water table. (Note 1, p. 126.)

B<sub>6</sub>.—*Fostoria, Seneca Co., Ohio*, at the SE. corner of Tiffin and Union streets, 1 meter from the curb. (Note 11, p. 127.)

C<sub>6</sub>.—In *Hancock Co., Ohio*, 2½ miles W. of *Fostoria, Seneca Co., Ohio*, at a crossing; 50 meters N. of the Baltimore and Ohio R. R. tracks, in the W. end of the S. abutment of a small highway bridge over a creek. (Note 4, p. 127.)

D<sub>6</sub>.—Near *Godsend, Hancock Co., Ohio*, on the Baltimore and Ohio R. R. right of way, 150 meters W. of the water tank; on the steel girder bridge over a small creek at the N. end of the W. abutment. (Note 4, p. 127.)

740 Tol.—1.5 miles E. of *Bloomdale, Wood Co., Ohio*, T. 3 N., R. 12 E., sec. 31, in the S. end of the E. abutment of an iron highway bridge. (Note 17, p. 127.)

E<sub>6</sub>.—¾ mile E. of *Bloomdale, Wood Co., Ohio*, at the corporation limits, at the NE. corner of the road junction and close to a rail fence. (Note 11, p. 127.)

749 Bloomdale.—*Bloomdale, Wood Co., Ohio*, at the SW. corner of Main and the second street N. of the Baltimore and Ohio R. R. tracks; in a brick building used as a hardware store; a square cut in outline in the N. end of the stone sill.

F<sub>6</sub>.—*Bloomdale, Wood Co., Ohio*, at the corner of Garfield and Mulberry streets, at the main entrance of Trinity Methodist Episcopal Church; in the top face of the second step. (Note 1, p. 126.)

H<sub>6</sub>.—*Bairdstown, Wood Co., Ohio*, on Randolph avenue, 100 meters S. of the Baltimore and Ohio R. R. station; a square cut in the S. doorstep of a double house belonging to E. Knodle.

I<sub>g</sub>.—*Galatea, Wood Co., Ohio*, in the Baltimore and Ohio R. R. right of way, 150 meters E. of the Toledo and Ohio Central R. R. crossing; on the upper step of the NW. abutment of a large culvert. (Note 5, p. 127.)

J<sub>g</sub>.—*North Baltimore, Wood Co., Ohio*, on the W. side of Main street, 40 meters N. of the Baltimore and Ohio R. R. tracks; in the N. end of the sill of the S. part of the double store marked "A. J. Steele, 1900." (Note 1, p. 126.)

726 Tol.— $\frac{1}{2}$  mile S. of *North Baltimore, Wood Co., Ohio*, in the SW. abutment of an iron bridge over a creek. (Note 17, p. 127.)

K<sub>g</sub>.— $\frac{1}{2}$  mile W. of *North Baltimore, Wood Co., Ohio*, at the NE. corner of the intersection of Broadway and the street at the city limits. (Note 2, p. 126.)

L<sub>g</sub>.—About  $1\frac{1}{2}$  miles W. of *North Baltimore, Wood Co., Ohio*, at a road crossing; in the S. end of a culvert, in the center of the top. (Note 4, p. 127, marked "U. S. B. M.")

M<sub>g</sub>.—About  $2\frac{1}{2}$  miles W. of *North Baltimore, Wood Co., Ohio*, on the Baltimore and Ohio R. R. right of way, at a road crossing; in the S. end of a concrete culvert. (Note 5, p. 127.)

N<sub>g</sub>.—About 1 mile E. of *Hoytville, Wood Co., Ohio*, at a road crossing 50 meters S. of the Baltimore and Ohio R. R. tracks, 10 meters S. of the junction of highway; on the W. end of the N. abutment of a small iron bridge. (Note 1, p. 126.)

O<sub>g</sub>.—About 1 mile W. of *Hoytville, Wood Co., Ohio*, at a road crossing, 10 meters S. of the Baltimore and Ohio R. R. tracks, on the W. end of a small highway culvert; in the middle stone, 8 centimeters from the W. face. (Note 4, p. 127.)

P<sub>g</sub>.—About 1 mile E. of *Deshler, Henry Co., Ohio*, on the Baltimore and Ohio R. R. right of way, at a road crossing; in the N. end of a concrete culvert, in the center of the top surface. (Note 1, p. 126.)

I<sub>1</sub>.—*Deshler, Henry Co., Ohio*. (See App. 8, Report for 1899, p. 656.)

H<sub>1</sub>.—*Deshler, Henry Co., Ohio*. (See App. 8, Report for 1899, p. 656.)

J<sub>1</sub>.—*Belmore, Putnam Co., Ohio*. (See App. 8, Report for 1899, p. 656.)

#### DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN WARWICK AND UHRICHVILLE, OHIO, 1903.

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B. & O. 449.— $\frac{1}{4}$  mile NE. of *Warwick, Summit Co., Ohio*. (See p. 230.)

B. & O. 1.— $\frac{1}{2}$  mile S. of *Warwick, Summit Co., Ohio*, chiseled point between tracks on mud wall of S. abutment of bridge.

B. & O. 2.—In *Stark Co.*,  $1\frac{3}{4}$  miles SE. of *Warwick, Summit Co., Ohio*, at milepost 107. (Note 22, p. 127.)

B. & O. 3.—In *Stark Co.*,  $2\frac{3}{4}$  miles SE. of *Warwick, Summit Co., Ohio*, at milepost 106. (Note 22, p. 127.)

B. & O. 4.—500 feet SE. of station at *Canal Fulton, Stark Co., Ohio*, rail section set between east-bound track and siding at milepost 105.

B. & O. 5.—1 mile SE. of *Canal Fulton, Stark Co., Ohio*, at milepost 104. (Note 22, p. 127.)

B. & O. 6.—2 miles SE. of *Canal Fulton, Stark Co., Ohio*, at milepost 103. (Note 22, p. 127.)

B. & O. 7.—About 1 mile NW. of *Pauls, Stark Co., Ohio*, at milepost 102. (Note 22, p. 127.)

B. & O. 8.—About 1 mile W. of *Crystal Spring, Stark Co., Ohio*, near *Pauls*, chiseled point on NW. end of retaining wall on NE. side of tracks at milepost 101, near Coxey's white sand works.

B. & O. 9.—About  $\frac{1}{4}$  mile W. of *Crystal Spring, Stark Co., Ohio*, at milepost 100. (Note 22, p. 127.)

B. & O. 10.—About  $\frac{3}{4}$  mile SE. of *Crystal Spring, Stark Co., Ohio*, at milepost 99. (Note 22, p. 127.)

B. & O. 11.—About 2 miles N. of *Massillon, Stark Co., Ohio*, square cut in S. end of W. coping of box culvert on westbound tracks, 250 feet E. of milepost 98.

B. & O. 12.—About 1 mile N. of *Massillon, Stark Co., Ohio*, at milepost 97. (Note 22, p. 127.)

P. R. R.—*Massillon, Stark Co., Ohio*, cut on NE. corner coping Pennsylvania R. R. arch bridge, 300 feet E. of bridge 4.

B. & O. 13.— $\frac{1}{4}$  mile NW. of *Massillon, Stark Co., Ohio*, copper bolt set in N. end of mud wall of E. abutment of bridge at telegraph pole 96/10.

- P. R. R.—*Massillon, Stark Co., Ohio*, cut on the N. end of E. back wall Pennsylvania R. R. bridge 5.
- B. & O. 14.— $\frac{1}{2}$  mile SE. of *Massillon, Stark Co., Ohio*, copper bolt set in N. end of W. abutment of highway bridge over river.
- B. & O. 15.—About  $1\frac{1}{2}$  miles S. of *Massillon, Stark Co., Ohio*, copper bolt set in SE. pedestal of water tank at Columbia, telegraph pole 94/4.
- B. & O. 16.—About  $2\frac{1}{2}$  miles S. of *Massillon, Stark Co., Ohio*, copper bolt set in NE. end of NW. coping of culvert for pipe drain at telegraph pole 93/7.
- B. & O. 17.—About  $4\frac{1}{4}$  miles S. of *Massillon, Stark Co., Ohio*, copper bolt set in N. end of W. coping of large concrete arch culvert near where old line is crossed by present line.
- B. & O. 18.—About  $\frac{3}{4}$  mile NE. of *Navarre, Stark Co., Ohio*, copper bolt set in SW. end of SE. coping of large stone arch 450 feet SW. of first Wheeling and Lake Erie crossing.
- B. & O. 19.— $\frac{3}{4}$  mile SW. of *Navarre, Stark Co., Ohio*, at milepost 89. (Note 22, p. 127.)
- B. & O. 20.— $\frac{1}{2}$  mile N. of *Justus, Stark Co., Ohio*, 300 feet S. of Wheeling and Lake Erie crossing, copper bolt set in N. end of W. coping of small culvert at telegraph pole 88/5.
- B. & O. 21.— $\frac{1}{2}$  mile S. of *Justus, Stark Co., Ohio*, copper bolt set in W. end of S. abutment of arch culvert near milepost 87.
- B. & O. 22.— $1\frac{1}{2}$  miles S. of *Justus, Stark Co., Ohio*, copper bolt set in W. end of S. abutment of arch culvert at telegraph pole 86.
- B. & O. 23.—1 mile N. of *Beach City, Stark Co., Ohio*, copper bolt set in S. end of W. coping of stone culvert for traction line near R. R.
- B. & O. 24.—800 feet N. of station at *Beach City, Stark Co., Ohio*, copper bolt set in W. end of S. abutment of bridge over creek.
- B. & O. 25.— $\frac{3}{4}$  mile SE. of *Beach City, Stark Co., Ohio*, copper bolt in SW. end of SE. abutment of bridge.
- B. & O. 26.—2 miles SE. of *Beach City, Stark Co., Ohio*, copper bolt set in SW. end of back wall, NW. abutment of bridge.
- B. & O. 27.—2 miles NW. of *Strasburg, Tuscarawas Co., Ohio*, at milepost 81. (Note 22, p. 127.)
- B. & O. 28.—1 mile NW. of *Strasburg, Tuscarawas Co., Ohio*, at milepost 80. (Note 22, p. 127.)
- B. & O. 29.—*Strasburg, Tuscarawas Co., Ohio*, at milepost 79. (Note 22, p. 127.)
- B. & O. 30.—About  $\frac{3}{4}$  mile SE. of *Strasburg, Tuscarawas Co., Ohio*, copper bolt set in SW. end of back wall of SE. abutment of bridge.
- B. & O. 31.—About 1 mile SE. of *Strasburg, Tuscarawas Co., Ohio*, copper bolt set in first course of masonry SE. end of SW. abutment of trolley overhead bridge, near milepost 78.
- B. & O. 32.—About 2 miles SE. of *Strasburg, Tuscarawas Co., Ohio*, copper bolt set in SE. end of SW. coping of culvert, 500 feet NW. of milepost 77.
- B. & O. 33.—3 miles SE. of *Strasburg, Tuscarawas Co., Ohio*, copper bolt set in S. end of W. coping of culvert, telegraph pole 76/6.
- B. & O. 34.—2 miles NW. of *Canal Dover, Tuscarawas Co., Ohio*, at milepost 75. (Note 22, p. 127.)
- B. & O. 35.—1 mile NW. of *Canal Dover, Tuscarawas Co., Ohio*, copper bolt set in SW. end of bridge seat of SE. abutment of culvert at telegraph pole 74/4.
- B. & O. 36.— $\frac{1}{4}$  mile W. of station at *Canal Dover, Tuscarawas Co., Ohio*, copper bolt set in easterly pedestal of water tank, telegraph pole 73/11.
- B. & O. 37.— $\frac{1}{2}$  mile SE. of *Canal Dover, Tuscarawas Co., Ohio*, copper bolt set in NE. end of mud wall of NW. abutment of Tuscarawas River bridge.
- B. & O. 38.— $1\frac{1}{4}$  miles SE. of *Canal Dover, Tuscarawas Co., Ohio*, at telegraph pole 72/1. (Note 21, p. 127.)
- B. & O. 38A.—About  $1\frac{1}{4}$  miles SE. of *Canal Dover, Tuscarawas Co., Ohio*, 200 feet SE. of telegraph pole 72/1. (Note 21, p. 127.)
- B. & O. 39.—1 mile NW. of *New Philadelphia, Tuscarawas Co., Ohio*, at milepost 71. (Note 21, p. 127.)
- B. & O. 40.—*New Philadelphia, Tuscarawas Co., Ohio*, at milepost 70. (Note 21, p. 127.)
- B. & O. 41.—About  $\frac{1}{2}$  mile SE. of *New Philadelphia, Tuscarawas Co., Ohio*, copper bolt set in NW. end of SW. coping of culvert.
- B. & O. 42.—About 2 miles SE. of *New Philadelphia, Tuscarawas Co., Ohio*, rail section set on NE. side of tracks at milepost 68.
- B. & O. 43.—About 3 miles SE. of *New Philadelphia, Tuscarawas Co., Ohio*, copper bolt set in SW. end of SE. abutment of bridge at telegraph pole 67/1.

B. & O. 44.—About  $\frac{3}{4}$  mile NW. of *Goshen, Tuscarawas Co., Ohio*, copper bolt set in center of mud wall of SE. abutment of bridge at telegraph pole 66/18, NE. of present tracks.

B. & O. 45.— $\frac{1}{2}$  mile SE. of *Goshen, Tuscarawas Co., Ohio*, rail section set on NE. side of tracks at telegraph pole 65/15.

B. & O. 46.— $\frac{1}{4}$  mile W. of *Midvale, Tuscarawas Co., Ohio*, copper bolt set in S. end of E. abutment of bridge at telegraph pole 64/15.

B. & O. 47.— $\frac{1}{2}$  mile SE. of *Midvale, Tuscarawas Co., Ohio*, copper bolt set SW. of track in mud wall of SE. abutment of bridge at telegraph pole 63/20.

B. & O. 48.—About 1 mile N. of *Uhrichsville, Tuscarawas Co., Ohio*, copper bolt set in W. end of mud wall of S. abutment of undergrade highway crossing bridge near milepost 62.

DESCRIPTIONS OF PERMANENT BENCH MARKS BETWEEN CUMBERLAND, MD., AND BENWOOD, W. VA., 1904.

[These descriptions were furnished by the Chief Engineer of the Baltimore and Ohio Railroad. Where necessary, the names of the town, county, and State have been added for the purpose of indexing, and in many cases certain information has been condensed into the form of notes. In accordance with railroad usage, the directions in the descriptions as furnished were given according to the general direction of the railroad line. These have been changed to true directions as far as could be determined. In other respects the wording of the original descriptions has not been changed.]

B. & O. 154.—Near *Cumberland, Md.* (See App. 3, Report for 1903, p. 737.)

B. & O. 155.—Near *Cumberland, Md.* (See App. 3, Report for 1903, p. 737.)

B. & O. 1.—*Cumberland, Allegany Co., Md.*, copper bolt set in N. end of extension of W. abutment of overhead bridge 180C, near Green Street station.

B. & O. 3.—Near *Robert Station, Allegany Co., Md.*, copper bolt set in W. end of S. wall of small culvert about 700 feet S. of milepost 181.

B. & O. 4.— $\frac{1}{8}$  mile S. of *Robert Station, Allegany Co., Md.*, on small arch culvert at telegraph pole 182/7. (Note 26, p. 128.)

B. & O. 5.—Near *Cedar Cliff, Allegany Co., Md.*, on culvert at telegraph pole 183/11. (Note 26, p. 128.)

B. & O. 6.—Near *Cedar Cliff, Allegany Co., Md.*, square cut in N. end of W. coping of stone culvert at telegraph pole 184/6.

B. & O. 6A.—Near *Brady, Allegany Co., Md.*, bridge 71, telegraph pole 184/22. (Note 23, p. 128.)

B. & O. 7.— $\frac{1}{8}$  mile SW. of *Brady, Allegany Co., Md.*, copper bolt set in E. end of N. coping of culvert at telegraph pole 185/10.

B. & O. 7A.—1 mile SW. of *Brady, Allegany Co., Md.*, copper bolt set in native rock W. of tracks at telegraph pole 186/2.

B. & O. 8.— $\frac{1}{2}$  mile E. of *McKenzie Station, Allegany Co., Md.*, on undergrade highway bridge crossing at telegraph pole 186/37. (Note 23, p. 128.)

B. & O. 9.—*Potomac Station, Allegany Co., Md.*, on undergrade highway bridge. (Note 23, p. 128.)

B. & O. 10.—Near *Pinto, Allegany Co., Md.*, on arch culvert about 500 feet NE. of milepost 189. (Note 26, p. 128.)

B. & O. 11.—Near *Loundes, Allegany Co., Md.*, on culvert, 150 feet SW. of milepost 190. (Note 26, p. 128.)

B. & O. 12.—Near *Cresap, Allegany Co., Md.*, on culvert at telegraph pole 190/23. (Note 23, p. 128.)

B. & O. 13.—800 feet SW. of *Rawlings, Allegany Co., Md.*, on bridge 75, opposite telegraph pole 191/23. (Note 24, p. 128.)

B. & O. 14.—Near *Rawlings, Allegany Co., Md.*, opposite milepost 193. (Note 21, p. 127.)

B. & O. 15.—Near *Black Oak, Allegany Co., Md.*, opposite milepost 194. (Note 21, p. 127.)

B. & O. 16.—200 feet SW. of *Black Oak, Allegany Co., Md.*, opposite milepost 195. (Note 21, p. 127.)

B. & O. 17.—About 0.9 mile SW. of *Black Oak, Allegany Co., Md.*, copper bolt set in NW. end of NE. abutment of West Virginia Central R. R. bridge at telegraph pole 195/30.

B. & O. 18.— $\frac{1}{2}$  mile NE. of *Dawson, Allegany Co., Md.*, at telegraph pole 196/24 $\frac{1}{2}$ . (Note 27, p. 128.)

B. & O. 19.—Near *Dawson, Allegany Co., Md.*, copper bolt set in native rock W. of tracks, 30 feet N. of telegraph pole 197/30.

B. & O. 20.—Near *Dawson, Allegany Co., Md.*, on arch 76, telegraph pole 198/11 $\frac{1}{2}$ . (Note 26, p. 128.)

B. & O. 21.—Near *Dawson, Allegany Co., Md.*, copper bolt set in bridge seat between tracks NW. abutment of bridge 77, opposite telegraph pole 199/17, near twenty-first bridge station.

B. & O. 22.—Near *Keyser, Mineral Co., W. Va.*, copper bolt set between tracks in S. abutment of bridge, opposite telegraph pole 201/8.

B. & O. 23.—*Keyser, Mineral Co., W. Va.*, opposite milepost 202, near center of Keyser yards. (Note 21, p. 127.)

B. & O. 24.—Near *Keyser, Mineral Co., W. Va.*, opposite milepost 203, at NW. end of Keyser yards. (Note 21, p. 127.)

B. & O. 25.—Near *Keyser, Mineral Co., W. Va.*, opposite milepost 204. (Note 21, p. 127.)

B. & O. 26.—Near *Piedmont, Mineral Co., W. Va.*, on bridge at telegraph pole 204/30. (Note 24, p. 128.)

B. & O. 26A.—Near *Piedmont, Mineral Co., W. Va.*, on bridge at telegraph pole 205/21. (Note 23, p. 128.)

B. & O. 27.— $\frac{1}{2}$  mile SE. of *Piedmont, Mineral Co., W. Va.*, opposite milepost 206. (Note 21, p. 127.)

B. & O. 28.— $\frac{1}{2}$  mile SW. of *Piedmont, Mineral Co., W. Va.*, opposite milepost 207. (Note 21, p. 127.)

B. & O. 28A.—400 feet W. of *West Virginia Central Junction, Mineral Co., W. Va.*, copper bolt set in SW. end of bridge seat, NW. abutment of bridge for siding over Potomac River.

B. & O. 29.— $\frac{1}{4}$  mile E. of *Bloomington, Garrett Co., Md.*, on bridge 79, over Potomac River, second step from top. (Note 23, p. 128.)

B. & O. 30.—Near *Bloomington, Garrett Co., Md.*, opposite milepost 209. (Note 21, p. 127.)

B. & O. 31.—Near *Black Bear, Garrett Co., Md.*, opposite milepost 210. (Note 21, p. 127.)

B. & O. 31A.—Near *Black Bear, Garrett Co., Md.*, square cut in foundation, SW. side of SE. portal of Everetts tunnel.

B. & O. 32.—Near *Black Bear, Garrett Co., Md.*, copper bolt set in foundation, NE. side of NW. portal of Everetts tunnel, telegraph pole 210/30.

1380 C.—About  $1\frac{1}{4}$  miles E. of *Bond Station, Garrett Co., Md.*, 2.6 miles E. of *Frankville*; 100 feet E. of signal station, S. side of Baltimore and Ohio R. R.; a B. M. of the United States Geological Survey consisting of a bronze tablet set in rock. (Note 17, p. 127.)

B. & O. 33.— $\frac{1}{2}$  mile E. of *Bond Station, Garrett Co., Md.*, opposite milepost 212. (Note 21, p. 127.)

B. & O. 34.—*Crabtree, Garrett Co., Md.*, opposite milepost 213. (Note 21, p. 127.)

B. & O. 35.—Near *Frankville, Garrett Co., Md.*, 45 feet E. of telegraph pole 213/39. (Note 27, p. 128.)

B. & O. 36.—Near *Frankville, Garrett Co., Md.*, 30 feet NE. of telegraph pole 215/03(?). (Note 27, p. 128.)

B. & O. 37.— $1\frac{1}{2}$  miles SW. of *Frankville, Garrett Co., Md.*, copper bolt set in SW. end of retaining wall, NW. of tracks, near milepost 216, 500 feet NE. of Hitchcock tunnel.

B. & O. 38.— $2\frac{1}{2}$  miles SW. of *Frankville, Garrett Co., Md.*, opposite milepost 217. (Note 21, p. 127.)

B. & O. 39.—1 mile NE. of *Swanton, Garrett Co., Md.*, on bridge 80, at telegraph pole 218/13 $\frac{1}{2}$ . (Note 26, p. 128.)

B. & O. 40.— $\frac{1}{4}$  mile NE. of *Swanton, Garrett Co., Md.*, copper bolt set in NW. end of bridge seat of NE. abutment of bridge 83, telegraph pole 219/5 $\frac{1}{2}$ .

B. & O. 40A.— $\frac{1}{4}$  mile SW. of *Swanton, Garrett Co., Md.*, on bridge 84, telegraph pole 219/21. (Note 24, p. 128.)

B. & O. 41.— $1\frac{1}{4}$  miles SW. of *Swanton, Garrett Co., Md.*, on bridge at telegraph pole 220/19. (Note 24, p. 128.)

B. & O. 42.— $1\frac{3}{4}$  miles SW. of *Swanton, Garrett Co., Md.*, opposite milepost 221. (Note 21, p. 127.)

B. & O. 43.— $1\frac{1}{4}$  miles NE. of *Allamont, Garrett Co., Md.*, opposite milepost 222. (Note 21, p. 127.)

B. & O. 44.— $\frac{1}{4}$  mile E. of *Allamont, Garrett Co., Md.*, opposite milepost 223, about at summit. (Note 21, p. 127.)

B. & O. 45.— $\frac{3}{4}$  mile W. of *Allamont, Garrett Co., Md.*, opposite milepost 224. (Note 21, p. 127.)

B. & O. 46.—1 mile E. of *Deer Park, Garrett Co., Md.*, opposite milepost 225. (Note 21, p. 127.)

B. & O. 47.—200 feet E. of the station at *Deer Park, Garrett Co., Md.*, opposite milepost 226. (Note 21, p. 127.)

B. & O. 47A.—*Deer Park, Garrett Co., Md.*, 500 feet NE. of the station for Deer Park Hotel; copper bolt set in the SW. corner of the culvert at telegraph pole 226/14 $\frac{1}{2}$ .

2447C.—*Deer Park, Garrett Co., Md.*, between two Baltimore and Ohio stations, 725 feet NE. of the station for Deer Park Hotel; on SW. wing wall of abutment of stone culvert; a B. M. of the United States Geological Survey, consisting of an aluminum tablet. (Note 17, p. 127.)

B. & O. 48.—Near *Deer Park, Garrett Co., Md.*, 0.6 mile SW. of the station for Deer Park Hotel, opposite milepost 227. (Note 21, p. 127.)

B. & O. 49.— $1\frac{1}{4}$  miles E. of *Mountain Lake Park, Garrett Co., Md.*, opposite milepost 228. (Note 21, p. 127.)

B. & O. 50.— $\frac{1}{4}$  mile E. of *Mountain Lake Park*, *Garrett Co., Md.*, copper bolt set in W. end of N. wing of W. abutment of bridge 86, telegraph pole 229/6 $\frac{1}{2}$ .

B. & O. 51.—0.3 mile W. of *Mountain Lake Park*, *Garrett Co., Md.*, on bridge, at telegraph pole 229/29. (Note 23, p. 128.)

B. & O. 52.—1 mile S. of *Oakland*, *Garrett Co., Md.*, opposite milepost 231. (Note 21, p. 127.)

B. & O. 53.—300 feet SE. of the station at *Oakland*, *Garrett Co., Md.*, on bridge, 7 feet below grade. (Note 23, p. 128.)

B. & O. 53A.— $\frac{1}{2}$  mile NW. of *Oakland*, *Garrett Co., Md.*, copper bolt set in NE. end of SE. wing of NE. abutment of highway bridge, opposite telegraph pole 232/22.

B. & O. 54.— $1\frac{1}{2}$  miles NW. of *Oakland*, *Garrett Co., Md.*, on bridge 88 over *Youghiogheny River*. (Note 24, p. 128.)

B. & O. 55.—2 miles NW. of *Oakland*, *Garrett Co., Md.*, opposite milepost 234. (Note 21, p. 127.)

B. & O. 56.—3 miles W. of *Oakland*, *Garrett Co., Md.*, opposite milepost 235. (Note 21, p. 127.)

B. & O. 57.—Near *Skipnish*, *Garrett Co., Md.*, opposite milepost 236. (Note 21, p. 127.)

B. & O. 58.— $\frac{1}{2}$  mile SE. of *Hutton*, *Garrett Co., Md.*, opposite milepost 237. (Note 21, p. 127.)

B. & O. 59.— $\frac{1}{2}$  mile NW. of *Hutton*, *Garrett Co., Md.*, opposite milepost 238. (Note 21, p. 127.)

B. & O. 59A.— $\frac{1}{4}$  mile NW. of *Corinth*, *Preston Co., W. Va.*, on bridge, telegraph pole 238/20. (Note 26, p. 128.)

B. & O. 60.—Near *Rinard*, *Preston Co., W. Va.*, opposite milepost 239. (Note 21, p. 127.)

B. & O. 61.— $\frac{1}{2}$  mile E. of *Riggs*, *Preston Co., W. Va.*, on arch culvert, 250 feet W. of milepost 240. (Note 26, p. 128.)

B. & O. 62.—1 mile SE. of *Terra Alta*, *Preston Co., W. Va.*, opposite milepost 241. (Note 21, p. 127.)

B. & O. 63.—500 feet E. of the station at *Terra Alta*, *Preston Co., W. Va.*, opposite milepost 242. (Note 21, p. 127.)

B. & O. 64.—0.8 mile NW. of *Terra Alta*, *Preston Co., W. Va.*, on small bridge at telegraph pole 242/35. (Note 23, p. 128.)

B. & O. 65.— $1\frac{1}{2}$  miles W. of *Terra Alta*, *Preston Co., W. Va.*, copper bolt set in foundation of S. side of E. portal of tunnel.

B. & O. 66.—3 miles SW. of *Terra Alta*, *Preston Co., W. Va.*, opposite milepost 245. (Note 21, p. 127.)

B. & O. 67.—4 miles SW. of *Terra Alta*, *Preston Co., W. Va.*, opposite milepost 246. (Note 21, p. 127.)

B. & O. 68.—1 mile SW. of *Rodamers*, *Preston Co., W. Va.*, copper bolt set in foundation, S. side of W. portal of *Rodamers* tunnel, telegraph pole 246/26.

B. & O. 69.— $2\frac{1}{2}$  miles NE. of *Amblersburg*, *Preston Co., W. Va.*, opposite milepost 248. (Note 21, p. 127.)

B. & O. 70.— $1\frac{1}{2}$  miles NE. of *Amblersburg*, *Preston Co., W. Va.*, opposite milepost 249. (Note 21, p. 127.)

B. & O. 71.— $\frac{1}{2}$  mile NE. of *Amblersburg*, *Preston Co., W. Va.*, opposite milepost 250. (Note 21, p. 127.)

B. & O. 72.—*Amblersburg*, *Preston Co., W. Va.*, on bridge, telegraph pole 250/27. (Note 26, p. 128.)

L.—*Amblersburg*, *Preston Co., W. Va.* (See App. 8, Report for 1899, p. 562.)

B. & O. 73.—About 1 mile SW. of *Amblersburg*, *Preston Co., W. Va.*, copper bolt set 15 feet from N. end of retaining wall, W. of tracks at telegraph pole 251/30.

B. & O. 74.— $1\frac{3}{4}$  miles NE. of *Rowlesburg*, *Preston Co., W. Va.*, on bridge 91, telegraph pole 252/17 $\frac{1}{2}$ . (Note 24, p. 128.)

B. & O. 74A.— $1\frac{1}{4}$  miles NE. of *Rowlesburg*, *Preston Co., W. Va.*, opposite milepost 253. (Note 21, p. 127.)

B. & O. 75.—Near *Rowlesburg*, *Preston Co., W. Va.*, copper bolt set N. of tracks in mud wall of E. abutment of *Cheat River* bridge.

B. & O. 76.—1 mile W. of *Rowlesburg*, *Preston Co., W. Va.*, 40 feet E. of telegraph pole 255/14. (Note 27, p. 128.)

B. & O. 76A.— $1\frac{1}{2}$  miles W. of *Rowlesburg*, *Preston Co., W. Va.*, copper bolt set in center of capstone N. end of long retaining wall E. of tracks, telegraph pole 255/25.

B. & O. 77.—2 miles NW. of *Rowlesburg*, *Preston Co., W. Va.*, copper bolt set in E. wing wall of N. abutment of viaduct at telegraph pole 256/5.

- B. & O. 78—B. & O. 84. (See page 245.)
- B. & O. 85.— $\frac{1}{4}$  mile E. of *Austen*, *Preston Co., W. Va.*, 50 feet W. of Murray tunnel. (Note 27, p. 128.)
- B. & O. 86.— $\frac{3}{4}$  mile W. of *Austen*, *Preston Co., W. Va.*, at milepost 265. (Note 21, p. 127.)
- B. & O. 87.—Near *Newburg*, *Preston Co., W. Va.*, at milepost 266. (Note 21, p. 127.)
- B. & O. 88.—Near *Newburg*, *Preston Co., W. Va.*, on bridge 95. (Note 24, p. 128.)
- B. & O. 90.—1 mile SW. of *Independence*, *Preston Co., W. Va.*, at milepost 269. (Note 21, p. 127.)
- B. & O. 91.—Near *Hardman*, *Preston Co., W. Va.*, on bridge 97. (Note 24, p. 128.)
- B. & O. 92.—1 mile NE. of *Ironton*, *Taylor Co., W. Va.*, copper bolt set in large rock about 100 feet SE. of tracks, nearly opposite milepost 271.
- B. & O. 93.—Near *Ironton*, *Taylor Co., W. Va.*, copper plug in rock 50 feet SE. of tracks, at telegraph pole 271/37.
- B. & O. 94.— $\frac{3}{4}$  mile SW. of *Ironton*, *Taylor Co., W. Va.*, on pipe culvert at telegraph pole 272/26. (Note 23, p. 128.)
- B. & O. 95.—1 mile NE. of *Thornton*, *Taylor Co., W. Va.*, at telegraph pole 273/25. (Note 21, p. 127.)
- B. & O. 96.—*Thornton*, *Taylor Co., W. Va.*, on bridge 99. (Note 23, p. 128.)
- B. & O. 97.— $\frac{3}{4}$  mile SW. of *Thornton*, *Taylor Co., W. Va.*, opposite telegraph pole 275/15. (Note 21, p. 127.)
- B. & O. 98.—1.6 miles W. of *Thornton*, *Taylor Co., W. Va.*, copper bolt set in SW. end of bridge seat of SE. abutment of bridge at telegraph pole 276/8.
- B. & O. 99.—2.5 miles W. of *Thornton*, *Taylor Co., W. Va.*, nearly opposite telegraph pole 277/5. (Note 27, p. 128.)
- B. & O. 100.—About 2 miles E. of *Grafton*, *Taylor Co., W. Va.*, copper bolt set between tracks in bridge seat, E. abutment of bridge 100.
- B. & O. 101.— $1\frac{1}{4}$  miles E. of *Grafton*, *Taylor Co., W. Va.*, at milepost 279. (Note 21, p. 127.)
- B. & O. 102.—*Grafton*, *Taylor Co., W. Va.*, copper bolt set in N. end of bridge seat of E. abutment of bridge over Tygart River, on Parkersburg branch.
- M.—*Grafton*, *Taylor Co., W. Va.*, (See App. 8, Report for 1899, p. 562.)
- B. & O. 103.—1 mile W. of *Grafton*, *Taylor Co., W. Va.*, near milepost 281. (Note 21, p. 127.)
- B. & O. 103A.—*Fetterman*, *Taylor Co., W. Va.*, on bridge 102. (Note 23, p. 128.)
- B. & O. 104.— $\frac{1}{2}$  mile N. of *Fetterman*, *Taylor Co., W. Va.*, copper bolt set in NW. end of NE. wing wall, NW. abutment of bridge 103.
- B. & O. 105.— $1\frac{1}{4}$  miles NW. of *Fetterman*, *Taylor Co., W. Va.*, at milepost 283. (Note 21, p. 127.)
- B. & O. 105A.— $1\frac{3}{4}$  miles NW. of *Fetterman*, *Preston Co., W. Va.*, on culvert at telegraph pole 283/20. (Note 26, p. 128.)
- B. & O. 106.— $2\frac{1}{2}$  miles N. of *Fetterman*, *Taylor Co., W. Va.*, on culvert at telegraph pole 284/11. (Note 26, p. 128.)
- B. & O. 107.—986 Pittsburg 1899.—Near *Bush*, *Taylor Co., W. Va.*, and 3 miles SE. of *Valley Falls*, *W. Va.* (See App. 8, Report for 1899, p. 866.)
- B. & O. 107A.—Near *Bush*, *Taylor Co., W. Va.*, on bridge at telegraph pole 285/28. (Note 23, p. 128.)
- B. & O. 108.— $\frac{1}{2}$  mile NW. of *Bush*, *Taylor Co., W. Va.*, on culvert at telegraph pole 286/10. (Note 26, p. 128.)
- B. & O. 109.—In *Taylor Co.*, about 1 mile E. of *Valley Falls*, *Marion Co., W. Va.*, at milepost 287. (Note 21, p. 127.)
- B. & O. 110.—*Valley Falls*, *Marion Co., W. Va.*, copper bolt set in native rock N. of track, 50 feet W. of milepost 288.
- B. & O. 111.—1 mile NW. of *Valley Falls*, *Marion Co., W. Va.*, copper bolt set in NW. end of SW. coping of arch bridge 105, near milepost 289.
- B. & O. 112.— $\frac{1}{4}$  mile NW. of *Hammond*, *Marion Co., W. Va.*, on arch bridge 107. (Note 26, p. 128.)
- B. & O. 113.—1 mile W. of *Hammond*, *Marion Co., W. Va.*, rail section set NW. of tracks at telegraph pole 290/20.
- B. & O. 114.— $\frac{1}{2}$  mile NW. of *Powells*, *Marion Co., W. Va.*, on bridge 108, telegraph pole 291/28. (Note 26, p. 128.)
- B. & O. 115.— $1\frac{1}{2}$  miles NW. of *Powells*, *Marion Co., W. Va.*, copper bolt set in native rock, 35 feet W. of telegraph pole 292/14.
- B. & O. 116.—1.2 miles SE. of *Colfax*, *Marion Co., W. Va.*, on arch culvert at telegraph pole 293/11. (Note 26, p. 128.)



B. & O. 117.—*Colfax, Marion Co., W. Va.*, copper bolt set in center of N. capstone of W. coping of bridge 109.

B. & O. 118.—1 mile NW. of *Colfax, Marion Co., W. Va.*, copper bolt set near SW. end of NW. coping of arch culvert at telegraph pole 295/17.

B. & O. 119.—1 mile E. of *Bentons Ferry, Marion Co., W. Va.*, on arch culvert at telegraph pole 296/20. (Note 26, p. 128.)

B. & O. 120.—*Bentons Ferry, Marion Co., W. Va.*, copper bolt set in N. end of E. wing wall of N. abutment of bridge 111, telegraph pole 297/22.

885 Pittsburg 1899.—*Bentons Ferry, Marion Co., W. Va.* (See App. 8, Report for 1899, p. 866.)

B. & O. 121.—*Kingmont, Marion Co., W. Va.*, rail section set N. of tracks at telegraph pole 298/20.

B. & O. 122.—1 mile NE. of *Kingmont, Marion Co., W. Va.*, on large arch culvert at telegraph pole 299/21. (Note 26, p. 128.)

B. & O. 122A.—1½ miles NE. of *Kingmont, Marion Co., W. Va.*, on arch culvert at telegraph pole 299/37. (Note 26, p. 128.)

B. & O. 123.—*Gaston Junction, Marion Co., W. Va.*, copper bolt set in W. end of bridge seat, N. abutment of bridge 112, over Monongahela River.

B. & O. 124.—*Fairmont, Marion Co., W. Va.*, copper bolt set between tracks in SW. end of pier for overhead highway bridge.

B. & O. 125.—1 mile W. of *Fairmont, Marion Co., W. Va.*, copper bolt set in NW. end of bridge seat SW. abutment of Fairmont, Morgantown, and Pittsburg bridge over Monongahela River.

B. & O. 125A.—Near *Fairmont, Marion Co., W. Va.*, copper bolt set in S. end of bridge seat of E. abutment of bridge to Fairmont roundhouse.

B. & O. 126.—½ mile E. of *Barnesville, Marion Co., W. Va.*, copper bolt set in S. end of small culvert at telegraph pole 304/5.

B. & O. 127.—½ mile NW. of *Barnesville, Marion Co., W. Va.*, copper bolt set in stone pier, E. of tracks at Fairmont Coal Co. shaft mine.

B. & O. 128.—1½ miles E. of *Barrackville, Marion Co., W. Va.*, rail section set SE. of track at telegraph pole 305/30.

B. & O. 129.—¾ mile SE. of *Barrackville, Marion Co., W. Va.*, copper bolt set in bridge seat, W. abutment of bridge 114, close to N. truss of bridge at telegraph pole 306/24.

B. & O. 130.—*Barrackville Station, Marion Co., W. Va.*, copper bolt set in S. end of bridge seat, W. abutment of bridge 115.

B. & O. 131.—1 mile SW. of *Barrackville, Marion Co., W. Va.*, on bridge at telegraph pole 308/18. (Note 24, p. 128.)

B. & O. 132.—1¾ miles W. of *Barrackville, Marion Co., W. Va.*, on pipe culvert at telegraph pole 309/10. (Note 23, p. 128.)

B. & O. 133.—Near *Katy, Marion Co., W. Va.*, copper bolt set in bridge seat, NW. abutment of bridge at telegraph pole 310/22, just NE. of tracks.

B. & O. 134.—1¾ miles E. of *Underwood Station (Farmington), Marion Co., W. Va.*, on bridge 116, telegraph pole 311/5. (Note 24, p. 128.)

B. & O. 135.—¾ mile E. of *Underwood Station (Farmington), Marion Co., W. Va.*, rail section set on SW. side of tracks at milepost 312.

B. & O. 136.—*Underwood Station (Farmington), Marion Co., W. Va.*, on bridge 116¼. (Note 23, p. 128.)

B. & O. 137.—0.6 mile W. of *Underwood Station (Farmington), Marion Co., W. Va.*, on bridge 116½, at telegraph pole 313/15. (Note 23, p. 128.)

B. & O. 138.—1½ miles W. of *Underwood Station (Farmington), Marion Co., W. Va.*, copper bolt set in SE. end of NE. abutment of small bridge at telegraph pole 314/9.

B. & O. 139.—1¼ miles SE. of *Downs (Broomfield P. O.), Marion Co., W. Va.*, on bridge 117, at telegraph pole 315/12. (Note 24, p. 128.)

B. & O. 139A.—1 mile SE. of *Downs (Broomfield P. O.), Marion Co., W. Va.*, on bridge 118, telegraph pole 315/23. (Note 24, p. 128.)

953 Downs.—1 mile SE. of *Downs, Marion Co., W. Va.*, 2.8 miles W. of *Farmington, W. Va.*, on abutment of bridge, a B. M. of the United States Geological Survey, a chiseled square, marked 953.

B. & O. 140.—Near station of *Downs, Marion Co., W. Va.*, on bridge 118½. (Note 24, p. 128.)

B. & O. 141.— $\frac{3}{4}$  mile W. of *Downs*, *Marion Co., W. Va.*, on bridge at telegraph pole 317/11. (Note 24, p. 128.)

B. & O. 142.— $1\frac{3}{4}$  miles SE. of *Mannington*, *Marion Co., W. Va.*, copper bolt set in E. end of bridge seat, N. abutment of highway bridge near milepost 318.

B. & O. 143.— $\frac{3}{4}$  mile SE. of *Mannington*, *Marion Co., W. Va.*, on bridge at telegraph pole 319/9. (Note 24, p. 128.)

B. & O. 144.—*Mannington*, *Marion Co., W. Va.*, NE. corner of front step of Exchange Bank.

975 Grafton.—*Mannington*, *Marion Co., W. Va.*, a B. M. of the United States Geological Survey, consisting of a bronze tablet set in pillar N. of door of Exchange Bank, marked "975 Grafton 1902." (Note 17, p. 127.)

B. & O. 145.—1 mile N. of *Mannington*, *Marion Co., W. Va.*, on bridge 119. (Note 24, p. 128.)

B. & O. 146.— $1\frac{1}{2}$  miles NW. of *Mannington*, *Marion Co., W. Va.*, on bridge 120, near telegraph pole 321/23. (Note 24, p. 128.)

B. & O. 147.— $2\frac{1}{4}$  miles NW. of *Mannington*, *Marion Co., W. Va.*, on bridge 121. (Note 24, p. 128.)

B. & O. 148.— $2\frac{3}{4}$  miles NW. of *Mannington*, *Marion Co., W. Va.*, copper bolt set between track and E. truss in bridge seat N. abutment bridge 123.

B. & O. 149.— $\frac{3}{4}$  mile S. of *Metz*, *Marion Co., W. Va.*, rail section set E. of tracks, at telegraph pole 323/30.

B. & O. 150.— $\frac{1}{4}$  mile N. of *Metz*, *Marion Co., W. Va.*, on bridge at telegraph pole 324/25. (Note 24, p. 128.)

B. & O. 151.— $1\frac{1}{2}$  miles NW. of *Metz*, *Marion Co., W. Va.*, on bridge at milepost 326. (Note 24, p. 128.)

B. & O. 152.— $\frac{1}{4}$  mile SE. of *Glover Gap*, *Marion Co., W. Va.*, rail section set S. of tracks, at milepost 327.

B. & O. 153.— $\frac{3}{4}$  mile NW. of *Glover Gap*, *Marion Co., W. Va.*, rail section set S. of tracks, at milepost 328.

B. & O. 153A.— $1\frac{1}{4}$  miles NW. of *Glover Gap*, *Marion Co., W. Va.*, copper bolt set in N. corner of small culvert at telegraph pole 328/24.

B. & O. 154.—2 miles NW. of *Glover Gap*, *Marion Co., W. Va.*, on bridge at telegraph pole 329/10. (Note 24, p. 128.)

B. & O. 155.— $\frac{3}{4}$  mile S. of *Cottontown*, *Wetzel Co., W. Va.*, on large arch bridge 126,  $\frac{1}{2}$  mile N. of Burton tunnel. (Note 26, p. 128.)

B. & O. 156.—*Cottontown*, *Wetzel Co., W. Va.*, on bridge near telegraph pole 331/5. (Note 24, p. 128.)

B. & O. 157.—*Burton*, *Wetzel Co., W. Va.*, copper bolt set in bridge seat NW. abutment bridge at telegraph pole 331/27, between main track and eastbound siding.

B. & O. 158.—0.9 mile NW. of *Burton*, *Wetzel Co., W. Va.*, copper bolt set in W. wing of S. end stone face for pipe culvert at telegraph pole 332/23.

B. & O. 159.— $\frac{3}{4}$  mile SE. of *Hundred*, *Wetzel Co., W. Va.*, copper bolt set in NW. end of SW. coping of box culvert at telegraph pole 333/5.

B. & O. 160=1013 Grafton.—Just W. of *Hundred*, *Wetzel Co., W. Va.*, United States Geological Survey B. M.; a tablet marked "1013 Grafton 1902" set in NE. end of NW. bridge seat, bridge 128. (Note 17, p. 127.)

B. & O. 161.— $1\frac{1}{4}$  miles NW. of *Hundred*, *Wetzel Co., W. Va.*, copper bolt set in N. end of W. bridge seat of bridge at telegraph pole 335/7.

B. & O. 161A.— $1\frac{3}{4}$  miles NW. of *Hundred*, *Wetzel Co., W. Va.*, on bridge 130, at telegraph pole 335/23. (Note 23, p. 128.)

B. & O. 162.— $1\frac{3}{4}$  miles E. of *Littleton*, *Wetzel Co., W. Va.*, on bridge 131, at telegraph pole 336/21. (Note 23, p. 128.)

B. & O. 163.— $\frac{3}{4}$  mile E. of *Littleton*, *Wetzel Co., W. Va.*, on bridge 133, telegraph pole 337/3. (Note 23, p. 128.)

B. & O. 163A.— $\frac{1}{2}$  mile E. of *Littleton*, *Wetzel Co., W. Va.*, on bridge 135. (Note 23, p. 128.)

B. & O. 164.—*Littleton*, *Wetzel Co., W. Va.*, rail section set between main track and siding at milepost 338.

- B. & O. 165.— $\frac{3}{4}$  mile NW. of *Littleton*, *Wetzel Co.*, *W. Va.*, rail section set S. of track at milepost 339.
- B. & O. 166.— $\frac{3}{4}$  mile S. of *Board Tree*, *Marshall Co.*, *W. Va.*, center line pin at S. end of *Board Tree* tunnel.
- B. & O. 167.— $\frac{1}{4}$  mile S. of *Board Tree*, *Marshall Co.*, *W. Va.*, copper bolt set in rock projecting from under W. end of first course of retaining wall at N. end of *Board Tree* tunnel E. of track.
- B. & O. 168.— $\frac{1}{2}$  mile NW. of *Board Tree*, *Marshall Co.*, *W. Va.*, rail section set N. of tracks at telegraph pole 341/30.
- B. & O. 169.—1.4 miles SE. of *Bellton*, *Marshall Co.*, *W. Va.*, rail section set N. of tracks at telegraph pole 343/4.
- B. & O. 170.— $\frac{1}{2}$  mile S. of *Bellton*, *Marshall Co.*, *W. Va.*, rail section set between main track and siding at milepost 344.
- B. & O. 170A.—Near *Denver Station* (*Bellton*), *Marshall Co.*, *W. Va.*, on bridge 136. (Note 23, p. 128.)
- B. & O. 171.— $\frac{3}{4}$  mile N. of *Bellton*, *Marshall Co.*, *W. Va.*, copper bolt set in bridge seat of E. abutment of bridge 137, just S. of present track.
- B. & O. 172.— $\frac{1}{8}$  mile S. of *Woodruff*, *Marshall Co.*, *W. Va.*, rail section set E. of tracks at milepost 346.
- B. & O. 173.— $\frac{1}{8}$  mile N. of *Woodruff*, *Marshall Co.*, *W. Va.*, rail section set E. of track at milepost 347.
- B. & O. 174.— $\frac{1}{2}$  mile S. of *Cogley*, *Marshall Co.*, *W. Va.*, rail section set between main track and siding at milepost 348.
- B. & O. 175.— $\frac{1}{2}$  mile N. of *Cogley*, *Marshall Co.*, *W. Va.*, rail section set E. of tracks at milepost 349.
- B. & O. 176.—2 miles SE. of *Cameron*, *Marshall Co.*, *W. Va.*, rail section set E. of tracks at N. end of *Welling* tunnel.
- B. & O. 177.—1 mile E. of *Cameron*, *Marshall Co.*, *W. Va.*, rail section set N. of tracks at telegraph pole 350/30.
- B. & O. 178.— $\frac{1}{4}$  mile E. of *Cameron*, *Marshall Co.*, *W. Va.*, copper bolt set in S. end of S. wing wall, W. abutment of bridge 138.
- B. & O. 179.—1 mile W. of *Cameron*, *Marshall Co.*, *W. Va.*, rail section set between main track and siding at telegraph pole 352/30.
- B. & O. 180.—*Loudenville*, *Marshall Co.*, *W. Va.*, copper bolt set in NE. end of NW. bridge seat of bridge 139.
- B. & O. 181.— $\frac{3}{4}$  mile W. of *Loudenville*, *Marshall Co.*, *W. Va.*, copper bolt set in N. end of W. bridge seat of bridge at telegraph pole 354/27.
- B. & O. 182.— $1\frac{1}{2}$  miles E. of *Glen Easton*, *Marshall Co.*, *W. Va.*, on culvert at telegraph pole 355/10. (Note 26, p. 128.)
- B. & O. 183.— $\frac{1}{4}$  mile E. of *Glen Easton*, *Marshall Co.*, *W. Va.*, copper bolt set in S. end of bridge seat of W. abutment of bridge 141.
- B. & O. 184.— $\frac{3}{4}$  mile NW. of *Glen Easton*, *Marshall Co.*, *W. Va.*, copper bolt set in NE. end of NW. bridge seat of bridge at telegraph pole 357/12.
- B. & O. 184A.— $1\frac{1}{2}$  miles NW. of *Glen Easton*, *Marshall Co.*, *W. Va.*, on bridge at telegraph pole 357/27. (Note 23, p. 128.)
- B. & O. 185.— $2\frac{1}{2}$  miles NW. of *Glen Easton*, *Marshall Co.*, *W. Va.*, copper bolt set in S. end of W. bridge seat of bridge 143, telegraph pole 358/26.
- B. & O. 186.— $2\frac{1}{2}$  miles E. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, copper bolt set in S. capstone of W. abutment of bridge 145, telegraph pole 359/30.
- B. & O. 187.—2 miles E. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, copper bolt set in SE. corner of small culvert just E. of *Shepherds* tunnel.
- B. & O. 188.—1 mile E. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, copper bolt set in E. end of S. bridge seat at telegraph pole 361/9.
- B. & O. 189.— $\frac{1}{2}$  mile E. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, copper bolt set in N. end of E. bridge seat of bridge at telegraph pole 361/25.
- B. & O. 190.— $\frac{1}{2}$  mile NW. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, rail section set E. of track at telegraph pole 362/25.
- B. & O. 191.— $1\frac{1}{2}$  miles NW. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, rail section set NE. of the track at telegraph pole 363/25.

B. & O. 192.— $2\frac{1}{2}$  miles NW. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, copper bolt set in N. end of W. wing of N. abutment of bridge at telegraph pole 364/25.

B. & O. 193.—U.S.G.S.—4 miles NW. of *Rosbys Rock*, *Marshall Co.*, *W. Va.*, United States Geological Survey B. M., a square cut in N. end of SE. abutment of bridge 146, at telegraph pole 365/40.

B. & O. 194.— $1\frac{1}{2}$  miles SE. of *Moundsville*, *Marshall Co.*, *W. Va.*, rail section set W. of tracks at telegraph pole 367/4.

B. & O. 195.—U.S.G.S.—1 mile SE. of *Moundsville*, *Marshall Co.*, *W. Va.*, United States Geological Survey B. M., a square cut in SW. end of NW. abutment of bridge 148.

B. & O. 196.— $\frac{1}{4}$  mile NW. of *Moundsville*, *Marshall Co.*, *W. Va.*, square cut on N. pedestal of water tank 54.

B. & O. 197.— $1\frac{3}{8}$  miles NW. of *Moundsville*, *Marshall Co.*, *W. Va.*, rail section set SW. of tracks at milepost 370.

B. & O. 198.— $2\frac{3}{8}$  miles NW. of *Moundsville*, *Marshall Co.*, *W. Va.*, rail section set W. of tracks at milepost 371.

B. & O. 199.— $3\frac{1}{2}$  miles N. of *Moundsville*, *Marshall Co.*, *W. Va.*, copper bolt set in E. end of coping of arch over spring at telegraph pole 371/39.

B. & O. 200.—2 miles S. of *Benwood Junction*, *Marshall Co.*, *W. Va.*, rail section set between main track and siding at milepost 373.

B. & O. 200A.— $1\frac{1}{2}$  miles S. of *Benwood Junction*, *Marshall Co.*, *W. Va.*, on large arch culvert at telegraph pole 373/20. (Note 26, p. 128.)

B. & O. 201.—1 mile S. of *Benwood Junction*, *Marshall Co.*, *W. Va.*, at milepost 374. (Note 21, p. 127.)

B. & O. 202.—Near *Benwood Junction*, *Marshall Co.*, *W. Va.*, at milepost 375. (Note 21, p. 127.)

B. & O. 114.—Near *Benwood*, *Marshall Co.*, *W. Va.*, square cut on W. end of N. coping at E. end of E. approach to Ohio River bridge.

U.S.E. 94A.—*Benwood*, *Marshall Co.*, *W. Va.*, a cut on E. face of West Virginia shore pier of Baltimore and Ohio R. R. bridge over the Ohio River, 9.5 feet N. of SE. angle of pier, and about level with Ohio River R. R. track.

#### DESCRIPTIONS OF MISCELLANEOUS ADDITIONAL BENCH MARKS.

B. M. 39.—A triangle cut on crossing stone, corner of Vernon avenue and Ninth street, *Hunters Point*, *Long Island*, *N. Y.* Recovered in 1900.

II.—*Washington*, *D. C.*, at the N. entrance to the building of the Department of Agriculture; on the base of a lamp-post at the E. side of the entrance, 11 inches from the ground; a cross, close to the edge of the nick or place where a fragment of stone has been broken off.

I.—*Washington*, *D. C.*, just E. of the Washington Monument, at the N. side of the E. entrance to the small lodge; on the top surface of the stone steps, 3 inches from the E. edge and 3 inches from the S. side of the base of the column at the N. side of the entrance; the SW. quadrant of a cross made by intersecting lines 2 centimeters in length.

Russell NW. Base.—About 2 miles E. of *Russell*, *Russell Co.*, *Kans.*, in the NE.  $\frac{1}{4}$  of sec. 25, T. 13, R. 14, in a pasture belonging to Mr. Long, of Russell, Kans.; a point marked by a  $\frac{3}{4}$ -inch drill hole in the top of a sandstone post 1.5 feet long by 4 inches square.

U. S. E. 171B.—*Marietta*, *Washington Co.*, *Ohio*; on the Muskingum River lock at the mouth of the Muskingum River, on the N. corner of the top of the N. (or land) lock wall, on the W. (or

U S  
upstream) end. Marked B  $\square$  M  
591.88

#### CORRECTIONS TO DESCRIPTIONS AND ELEVATIONS OF BENCH MARKS PUBLISHED IN APPENDIX 8, REPORT FOR 1899.

Pages 472 and 555. It was reported on September 21, 1904, that "Tidal," at *Locust Grove*, *Bath Beach*, *Long Island*, *N. Y.*, was lost.

Pages 472 and 556. It was reported on December 16, 1903, by Mr. John H. Frazee, that No. 6, at *Astoria*, *Long Island*, *N. Y.*, had probably been destroyed by repairs.

Pages 557 and 558. It was reported in November, 1900, by Mr. Edmund P. Ramsey that the following B. Ms. could not be found: No. 10 at *Flushing*, *N. Y.*, and No. 12 at *College Point*, *N. Y.*

Page 562. Mr. O. E. Carr, levelman for the Baltimore and Ohio R. R., reported in 1904 that the following B. Ms. were not found: J, at *Keyser, W. Va.*; XX, at *Bloomington, Md.*; XXI, at *Oakland, Md.*; and XXVIII, at *Rowlesburg, W. Va.*

Page 654. Mr. C. H. Judson, assistant engineer, New York Central Lines, stated in a letter dated August 11, 1908, that B. M. U., at Alexis, Ohio, was about to be destroyed by improvements, and that the resident engineer had established a new B. M. which is 2.77 feet higher than the B. M. U., and is described as follows: On the top of a concrete box culvert under the Ann Arbor R. R., just W. of the crossing of the Ann Arbor R. R. over the Lake Shore and Michigan Southern Ry.; the top of the SW. corner, marked with a chiseled B. M.

Page 655. A letter from Mr. H. A. Twining, at Haskins, Ohio, on April 26, 1906, stated that B. M. A<sub>11</sub>, at *Hull Prairie, Ohio*, was about to be destroyed by repairs.

Page 670. For a later description of P. B. M. 45, at *Shreveport, La.*, see page 134 of this publication.

CORRECTIONS TO DESCRIPTIONS AND ELEVATIONS OF BENCH MARKS PUBLISHED IN APPENDIX 3, REPORT FOR 1903.

Page 469. Leveling in 1905 by Mr. C. P. Burgwyn indicates that City B. M., at *Richmond, Va.*, has probably been disturbed in elevation since 1892, when the leveling was done which gave the elevation printed in 1903.

Page 550. The elevation of D. W. Leggets Crossing near *Coopersville, N. Y.*, should be 40.4591 instead of 40.7591.

Page 554. The elevation of R. R. 60 near *Ossining, N. Y.*, should be 2.3875 instead of 2.2875.

Page 554. The elevation of E<sub>1</sub>, at *Cold Spring, N. Y.*, should be 3.9737 meters instead of 2.3410 meters.

Page 580. The elevations of the six B. Ms. at Fort Hamilton, given on this page, are based on tidal observations at Fort Hamilton and are not connected with the precise level net.

Pages 527 and 627. Mr. G. B. Nicholson, chief engineer of the Chicago, New Orleans and Texas Pacific R. R., on June 20, 1904, stated that B. M. Y<sub>1</sub>, near Kings Mountain, Ky., would probably be destroyed soon by improvements.

Pages 722 and 723. The following additional notes and corrections to bench marks along the Hudson River were furnished by J. B. Miller, Assistant, Coast and Geodetic Survey.

V. O. 9.—*Cold Spring, N. Y.*, just at the N. end of a rock cut and 6 feet E. of E. main track and 0.4 foot above the rails.

Ik'.—Near *Fishkill Landing, Dutchess Co., N. Y.*, 37½ rods S. of milepost 59, at the S. end of a rock cut, 20 feet W. of the W. main track, 55 feet N. of a block signal, 4 feet above the rails; a step cut in a broad sloping rock.

R. R. 118.—*Fishkill, N. Y.*, 6 feet E. of E. main track.

Ii'.—*New Hamburg, Dutchess Co., N. Y.*, 37 meters N. of the station, 64 meters N. of Main street, 2 meters W. of the center of the W. track, on an irregular rock 12 meters S. of the entrance to a rock cut leading to a tunnel, 0.2 meter above the rails; the E. edge of a shallow drill hole surrounded by a rude triangle.

Ig'.—*Poughkeepsie, N. Y.*, on the N. face instead of the E. face and 4 meters W. of the W. main track.

Vose.—*Poughkeepsie, N. Y.*, the northern and higher one of the similar crosses near together.

R. R. 162.—Near *Hyde Park, N. Y.* Not found in 1905.

Pages 722, 723. Mr. R. E. Dougherty, engineer of the New York Central and Hudson River R. R., on September 25, 1906, stated that B. Ms. Ih', Ig', Vose, and I<sub>1</sub>, at *Poughkeepsie, N. Y.*, would soon be destroyed on account of railroad improvements.

Pages 564 and 751. It was reported in 1907 that 17 MC, at *Morehead City, N. C.*, was destroyed.

Pages 568 and 763. B. M. 25C, at *Monaca, Pa.*, was not found in 1906.

Page 774. Mr. R. B. Burchfield, on July 13, 1905, reported that B. M. F<sub>5</sub>, at *Anthony, Kans.*, would probably soon be exposed to injury as the Poorman Co. were building a new office and would remove the old one.

CORRECTIONS TO DESCRIPTIONS AND ELEVATIONS PUBLISHED IN APPENDIX 4 OF THE COAST AND  
GEODETIC SURVEY REPORT FOR 1905.

Page 233. Mr. A. R. Cook, Division Engineer, Northern Pacific R. R., on June 1, 1907, reported that B<sub>1</sub>, near *Hot Springs, Wash.*, was about to be destroyed by raising abutments.

Page 234. I<sub>1</sub>.—*Easton, Kittitas Co., Wash.* The stone was originally set in the NE. corner of the yard surrounding A. J. Adams's residence, about 14 meters N. of the house, 0.74 meter from the N. fence, and 0.62 meter W. of the E. fence inclosing the yard; about 100 meters S. of the Northern Pacific Ry. main track. In 1907 the stone was moved to a position 44.6 feet S. 48° 33' W. of the original position. It is now 2 feet from the right-of-way fence and 48.0 feet from the track of the Chicago, Milwaukee and St. Paul Ry. (Note 2, p. 126, of this publication, except the cap is marked with a cross for the placing of the rod.)

## DESCRIPTIONS OF ADDITIONAL BENCH MARKS ON LINE FROM CUMBERLAND, MD., TO BENWOOD, W. VA.

B. & O. 78.—3 miles W. of *Rowlesburg, Preston Co., W. Va.*; at telegraph pole 257/9. Note 27, p. 128.

B. & O. 78A.— $\frac{1}{4}$  mile NW. of *Buckhorn, Preston Co., W. Va.*; copper bolt set in NW. end of retaining wall, NE. of tracks, 40 feet SE. of telegraph pole 257/20.

B. & O. 79.—1 mile NW. of *Buckhorn, Preston Co., W. Va.*; 40 feet NW. of telegraph pole 258/7. Note 27, p. 128.

B. & O. 80.—About  $\frac{1}{4}$  mile W. of *Anderson, Preston Co., W. Va.*; at milepost Baltimore 259. Note 21, p. 127.

B. & O. 81.—About  $\frac{1}{4}$  mile SE. of *Tunnelton, Preston Co., W. Va.*; at milepost Baltimore 260. Note 21, p. 127.

B. & O. 82.—About  $\frac{1}{4}$  mile W. of *Tunnelton, Preston Co., W. Va.*; copper bolt set in first step of retaining wall N. of tracks at E. portal of Kingwood tunnel.

B. & O. 83.—About 1 mile W. of *Tunnelton, Preston Co., W. Va.*; at W. end of Kingwood tunnel. Note 21, p. 127.

B. & O. 83A.—300 feet W. of *West End, Preston Co., W. Va.*; on bridge. Note 23, p. 128.

B. & O. 84.—About 1 mile E. of *Austen, Preston Co., W. Va.*; 40 feet S. of tracks, near telegraph pole 263/12. Note 27, p. 128.

*Index to elevations and descriptions of bench marks.*

[Alphabetical under each State and the States arranged in alphabetical order.]

## ALABAMA.

Place.	Elevation.		Description.			Place.	Elevation.		Description.		
	This publi- cation.	Rept. 1903, App. 3.	This publi- cation.	Rept. 1903, App. 3.	Rept. 1899, App. 3.		This publi- cation.	Rept. 1903, App. 3.	This publi- cation.	Rept. 1903, App. 3.	Rept. 1899, App. 3.
	pages.	pages.	pages.	pages.	pages.		pages.	pages.	pages.	pages.	pages.
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Bainbridge.....		530			703	Kimberl.....		478			710
Barton.....		530			701	Lamb's Ferry.....		531			706
Baylor.....		478			710	Larkinsville.....		529		637	
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## Index to elevations and descriptions of bench marks—Continued.

## ARKANSAS.

Place.	Elevation.		Description.			Place.	Elevation.		Description.		
	This publi- cation.	Rept. 1903, App. 3.	This publi- cation.	Rept. 1903, App. 3.	Rept. 1899, App. 8.		This publi- cation.	Rept. 1903, App. 3.	This publi- cation.	Rept. 1903, App. 3.	Rept. 1899, App. 8.
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